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Norstar
R2MFC Card Installation and Configuration Guide

NORTEL

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International Regulatory Information

CE	The CE Marking on this equipment indicates compliance with the following: This device conforms to Directive 1999/5/EC on Radio Equipment and Telecommunications Terminal Equipment as adopted by the European Parliament And Of The Council.	

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Hereby, Nortel Networks declares that this equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Information is subject to change without notice. Nortel Networks reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant. This equipment has been tested and found to comply with the European Safety requirements EN 60950 and EMC requirements EN 55022 (Class A) and EN 55024. These EMC limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial and light industrial environment.

Warning: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. The above warning is inserted for regulatory reasons. If any customer believes that they have an interference problem, either because their Nortel Networks product seems to cause interference or suffers from interference, they should contact their distributor immediately. The distributor will assist with a remedy for any problems and, if necessary, will have full support from Nortel Networks.

Safety

This equipment meets all applicable requirements of both the CSA C22.2 No.60950 and UL 60950.

The shock hazard symbol within an equilateral triangle is intended to alert personnel to electrical shock hazard or equipment damage. The following precautions should also be observed when installing telephone equipment.

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when working with telephone lines.

Danger: Risk of shock.
Read and follow installation instructions carefully.
Ensure the system and system expansion units are unplugged from the power socket and that any telephone or network cables are unplugged before opening the system or system expansion unit.
If installation of additional hardware and /or servicing is required, disconnect all telephone cable connections prior to unplugging the system equipment.
Ensure the system and system expansion units are plugged into the wall socket using a three-prong power cable before any telephone cables are connected.

Caution: Only qualified persons should service the system.
The installation and service of this hardware is to be performed only by service personnel having appropriate training and experience necessary to be aware of hazards to which they are exposed in performing a task and of measures to minimize the danger to themselves or other persons.
Electrical shock hazards from the telecommunication network and AC mains are possible with this equipment. To minimize risk to service personnel and users, the system must be connected to an outlet with a third-wire ground. Service personnel must be alert to the possibility of high leakage currents becoming available on metal system surfaces during power line fault events near network lines. These leakage currents normally safely flow to Protective Earth ground via the power cord. Therefore, it is mandatory that connection to an earthed outlet is performed first and removed last when cabling to the unit. Specifically, operations requiring the unit to be powered down must have the network connections (central office lines) removed first.

Important Safety Instructions

The following safety instructions cover the installation and use of the Product. Read carefully and retain for future reference.

Installation

WARNING: To avoid electrical shock hazard to personnel or equipment damage observe the following precautions when installing telephone equipment:

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines. The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

Use

When using your telephone equipment, basic safety precautions should always be followed to reduce risk of fire, electric shock and injury to persons, including the following:

1. Read and understand all instructions.

2. Follow the instructions marked on the product.

3. Unplug this product (or host equipment) from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

4. Do not use this product near water, for example, near a bath tub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool.

5. Do not place this product on an unstable cart, stand or table. The product may fall, causing serious damage to the product.

6. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built-in installation unless proper ventilation is provided.

7. Do not allow anything to rest on the power cord. Do not locate this product where the cord will be abused by persons walking on it.

8. Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.

9. Never spill liquid of any kind on the product.

10. To reduce the risk of electric shock do not disassemble this product, but have it sent to a qualified service person when some service or repair work is required.

11. Unplug this product (or host equipment) from the wall outlet and refer servicing to qualified service personnel under the following conditions:

a) When the power supply cord or plug is damaged or frayed.

b) If the product has been exposed to rain, water or liquid has been spilled on the product, disconnect and allow the product to dry out to see if it still operates; but do not open up the product.

c) If the product housing has been damaged.

d) If the product exhibits a distinct change in performance.

12. CAUTION: To eliminate the possibility of accidental damage to cords, plugs, jacks, and the telephone, do not use sharp instruments during the assembly procedures

13. WARNING: Do not insert the plug at the free end of the handset cord directly into a wall or baseboard jack. Such misuse can result in unsafe sound levels or possible damage to the handset.

14. Save these instructions.

Emergency Calling

Caution: Warning
Local, state and federal requirements for Emergency services support by Customer Premises Equipment vary. Consult your telecommunication service provider regarding compliance with applicable laws and regulations.

Hearing Aid Compatibility

System telephones are hearing-aid compatible, as defined in Section 68.316 of Part 68 FCC Rules.

Limited Warranty

Nortel Networks warrants this product against defects and malfunctions during a one (1) year period from the date of original purchase. If there is a defect or malfunction, Nortel Networks shall, at its option, and as the exclusive remedy, either repair or replace the telephone set at no charge, if returned within the warranty period.

If replacement parts are used in making repairs, these parts may be refurbished, or may contain refurbished materials. If it is necessary to replace the telephone set, it may be replaced with a refurbished telephone of the same design and color. If it should become necessary to repair or replace a defective or malfunctioning telephone set under this warranty, the provisions of this warranty shall apply to the repaired or replaced telephone set until the expiration of ninety (90) days from the date of pick up, or the date of shipment to you, of the repaired or replacement set, or until the end of the original warranty period, whichever is later. Proof of the original purchase date is to be provided with all telephone sets returned for warranty repairs.

Exclusions

Nortel Networks does not warrant its telephone equipment to be compatible with the equipment of any particular telephone company. This warranty does not extend to damage to products resulting from improper installation or operation, alteration, accident, neglect, abuse, misuse, fire or natural causes such as storms or floods, after the telephone is in your possession.

Nortel Networks shall not be liable for any incidental or consequential damages, including, but not limited to, loss, damage or expense directly or indirectly arising from the customers use of or inability to use this telephone, either separately or in combination with other equipment. This paragraph, however, shall not apply to consequential damages for injury to the person in the case of telephones used or bought for use primarily for personal, family or household purposes.

This warranty sets forth the entire liability and obligations of Nortel Networks with respect to breach of warranty, and the warranties set forth or limited herein are the sole warranties and are in lieu of all other warranties, expressed or implied, including warranties or fitness for particular purpose and merchantability.

Warranty Repair Services

Should the set fail during the warranty period:
In North America, call 1-800-574-1611 for further information.
Outside North America, contact your sales representative for return instructions. You will be responsible for shipping charges, if any. When you return this telephone for warranty service, you must present proof of purchase.

After Warranty Service

Nortel Networks offers ongoing repair and support for this product. This service provides repair or replacement of your Nortel Networks product, at Nortel Networks's option, for a fixed charge. You are responsible for all shipping charges. For further information and shipping instructions:
In North America, contact our service information number: 1-800-574-1611.
Outside North America, contact your sales representative.

Repairs to this product may be made only by the manufacturer and its authorized agents, or by others who are legally authorized. This restriction applies during and after the warranty period. Unauthorized repair will void the warranty.

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Preface

This guide explains how to install, configure, and maintain the Nortel R2MFC card.

The guide also provides information about the Command Line Interface (CLI) tool used to configure, operate, administer and maintain the R2MFC card from a computer.

Note: The CLI is separate from the Norstar Remote Utilities (NRU) tool.

The document contains the following chapters:

Chapter 1, "Overview" — introduces the elements of the R2MFC card.

Chapter 2, "Preparing to install the R2MFC card" — describes the process of preparing for R2MFC card installation.

Chapter 3, "Installing the R2MFC card" — describes the process of installing the R2MFC card and connecting the R2MFC card to the host system.

Chapter 4, "Configuring the R2MFC card" — describes the configuration tools and the process of configuring the R2MFC card.

Chapter 5, "R2MFC card maintenance" — describes the maintenance tools and the process of maintaining the R2MFC card.

Chapter 6, "Command Line Interface (CLI)" — describes the Command Line Interface and the commands used to configure, operate, administer, and maintain the R2MFC card.

Before you begin

This guide assumes the following:

- The host system is installed and initialized and is working correctly.
- The host system is running Norstar MICS 4.0, or greater. The R2MFC card is not compatible with Norstar CICS systems. Second dial tone is available only on Norstar 6.0 or higher.
- The R2MFC card must be installed in the Norstar main chassis, the R2MFC card is not compatible with the Norstar trunk module.
- Users have a working knowledge of the host system operations.
- All configuration installers have a working knowledge of the Windows operating system and graphical user interfaces.

How to get Help

This section explains how to get help for Nortel products and services.

Getting Help from the Nortel Web site

The best way to get technical support for Nortel products is from the Nortel Technical Support Web site:

http://www.nortel.com/support

This site provides quick access to software, documentation, bulletins, and tools to address issues with Nortel products. More specifically, the site enables you to:

- download software, documentation, and product bulletins
- search the Technical Support Web site and the Nortel Knowledge Base for answers to technical issues
- sign up for automatic notification of new software and documentation for Nortel equipment
- open and manage technical support cases

Getting Help over the phone from a Nortel Solutions Center

If you don't find the information you require on the Nortel Technical Support Web site, and have a Nortel support contract, you can also get help over the phone from a Nortel Solutions Center.

In North America, call 1-800-4NORTEL (1-800-466-7835).

Outside North America, go to the following Web site to obtain the phone number for your region:

http://www.nortel.com/callus

Getting Help from a specialist by using an Express Routing Code

To access some Nortel Technical Solutions Centers, you can use an Express Routing Code (ERC) to quickly route your call to a specialist in your Nortel product or service. To locate the ERC for your product or service, go to:

http://www.nortel.com/erc

Getting Help through a Nortel distributor or reseller

If you purchased a service contract for your Nortel product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller.

Acronyms

This guide uses the following acronyms (listed in alphabetical order):

AIS	Alarm Indication Signal
ANI	Automatic Number Identification
BPV	Bipolar Violations
CLI	Command Line Interface
CLID	Calling Line Identification
CO	Central Office
CRC4	Cyclic Redundancy Check 4
CSU	Channel Service Unit
DCH	D-Channel Handler
DTI Card	Digital Interface Card
DTMF	Dual Tone Multi-Frequency
EEPROM	Electrically Erasable Prorammable Read Only Memory
ETSI	European Telecommunications Standards Institute
FBER	Frame Bit Error
FEBE	Far End Block Error
ICS	Integrated Communication System
ISDN	Integrated Services Digital Network
KSU	Key Service Unit
LFA	Loss of Frame Alignment
LMA	Loss of Multiframe Alignment
LOS	Loss of Signal
MFC	Multi-Frequency Compelled
MSC	Media Services Card
OOF	Out-of-Frame
OOM	Out of CRC-4 Multiframe Alignment
OOS	Out Of Service
PCM	Pulse Code Modulation
PRI	Primary Rate Interface
RAI	Remote Alarm Indication

Chapter 1
Overview

This chapter provides an overview of the R2MFC card.

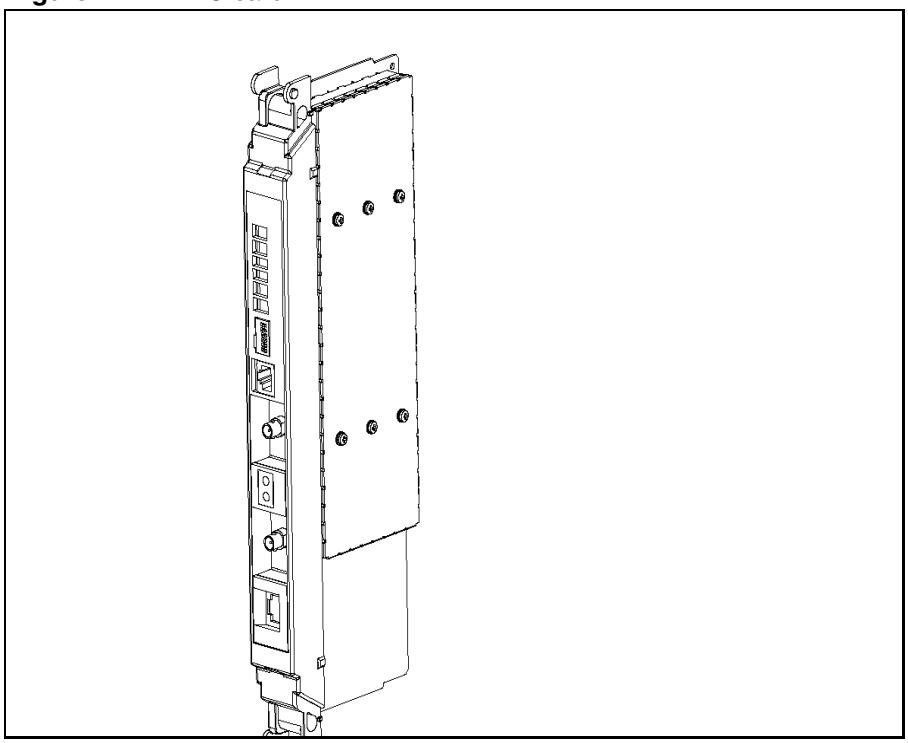
This chapter includes the following information:

- "General information"
- "Administration and maintenance tools" on page 20
- "R2MFC card faceplate elements" on page 20

General information

The R2MFC card is a digit trunk interface card (DTI card) that provides MFC-R2 connectivity over an E1 trunk. The card works as a converter between Euro-ISDN and MFC-R2 protocols, allowing the MFC-R2 protocol E1 to work directly with the Norstar system without the use of an external converter. The Norstar system recognizes the converter as a Euro-ISDN trunk DTI card and, therefore, provides all of the functionality on the MFC-R2 E1 that is available on a Euro-ISDN E1. The MFC-R2 trunk is controlled by DIP switches and the Command Line Interface (CLI) on the R2MFC card. Figure 1 provides an illustration of the R2MFC card.

Figure 1 R2MFC card



Administration and maintenance tools

R2MFC card configuration involves the following:

- Internal link configuration for the PRI internal link to the Norstar system. The internal link uses preset characteristics and, therefore, does not require localization.
- External link configuration of the MFC-R2 E1 the external interface to public network. The external link allows for localization in different countries.

External link configuration is performed using the DIP switches on the front of the R2MFC card or by using the CLI, which is accessed through a serial port on the faceplate of the R2MFC card. Internal link configuration is performed using a Norstar digital telephone set. Refer to **"Configuring the R2MFC card" on page 35** for information on how to use the configuration tools.

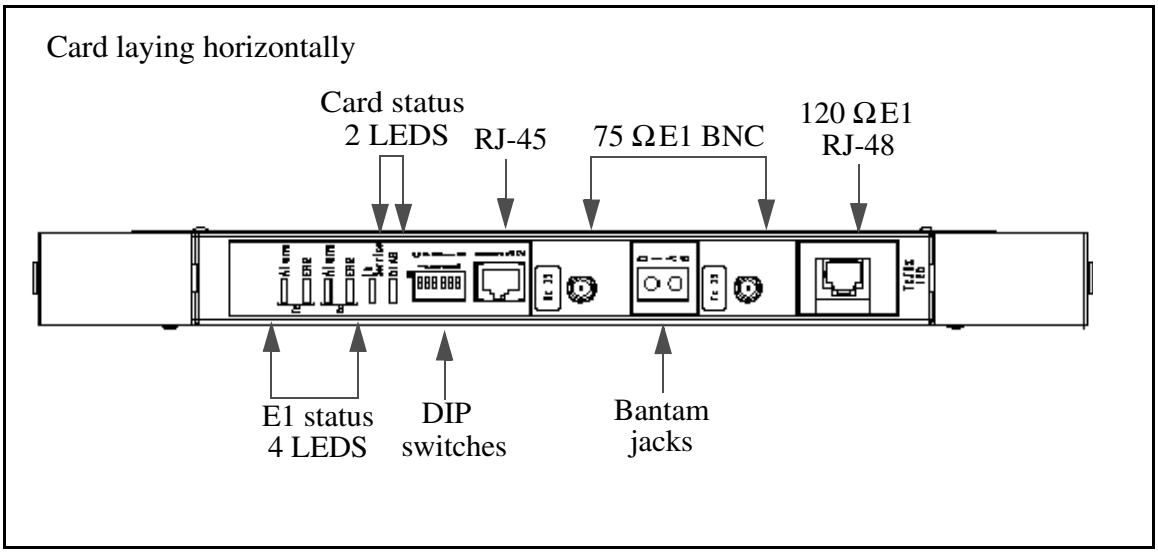
R2MFC card faceplate elements

The faceplate of the R2MFC card consists of the following elements:

- "System Status LEDs" on page 21
- "Config DIP switches" on page 21
- "RS232 port" on page 21
- "E1 Status LEDs" on page 22
- "Bantam jacks" on page 22
- "BNC and RJ-48 connectors" on page 22

Figure 2 illustrates the placement of these elements.

Figure 2 R2MFC card faceplate



System Status LEDs

The R2MFC card has two visual status monitor indicators near the top of the faceplate. They are:

- In Service LED — This green LED indicates the status of the E1 signal coming to the R2MFC card from the Norstar System.
- Diag LED — This red LED indicates if the R2MFC card is in a diagnostic or loopback mode.

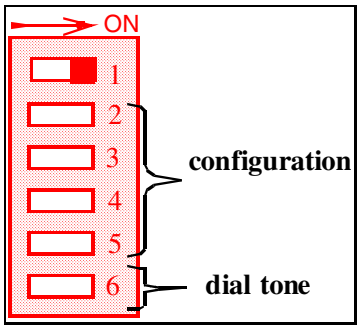
Config DIP switches

The R2MFC card has six config DIP switches on its faceplate. Use these DIP switches to set the following configurations for the R2MFC card:

- country
- problem diagnosis
- second dial tone

You must set these DIP switches before power is connected to the R2MFC card. Figure 3 shows the Config DIP switches.

Figure 3 Config DIP Switches



For DIP switch values and configuration information, see **"Configuring the R2MFC (external) link" on page 39**.

These DIP switches are also used for problem diagnostics. For specific settings and uses, see **"Diagnostic tools" on page 49**.

RS232 port

An RJ-45 serial port connector named RS232 is located on the faceplate of the R2MFC card. Use the N0026100 cable, shipped with the R2MFC card, to connect a computer to the RS232 port for advanced configuration or for CLI-based diagnostics of the R2MFC card. Appendix D, "CLI Cable Pinout," on page 111 shows the pinout information to make a new N0026100 cable.

E1 Status LEDs

The R2MFC card has four visual status monitor indicators at the top of the faceplate. They are:

- ERR Tx — indicates a Transmit error on the external E1 link
- ERR Rx — indicates a Receive error on the external E1link
- ALM Tx — indicates a Transmit alarm on the external E1 link
- ALM Rx — indicates a Receive alarm on the external E1 link

Bantam jacks

The R2MFC card contains Bantam jacks in the middle of the faceplate, to be used for connecting diagnostic equipment. The jacks are labeled DIAG.

BNC and RJ-48 connectors

The R2MFC card has both BNC and RJ-48 external E1 connectors located in the middle and bottom portion of the faceplate. Use these connectors to connect the R2MFC card to the Central Office (CO).

The default interface is based on the country code selected. Mexico variant 1 is the factory default. See Appendix A, “Config DIP switch settings and definitions,” on page 77 for the country code default settings.

Chapter 2
Preparing to install the R2MFC card

This chapter provides an overview of the preparation required to install the R2MFC card in a host system. (The host system is the Norstar system to which the R2MFC card connects.)

The information in this chapter is based on the following assumptions:

- The host system is installed, initialized, and tested.
- The installer has a working knowledge of the host system and an understanding of telecommunications.

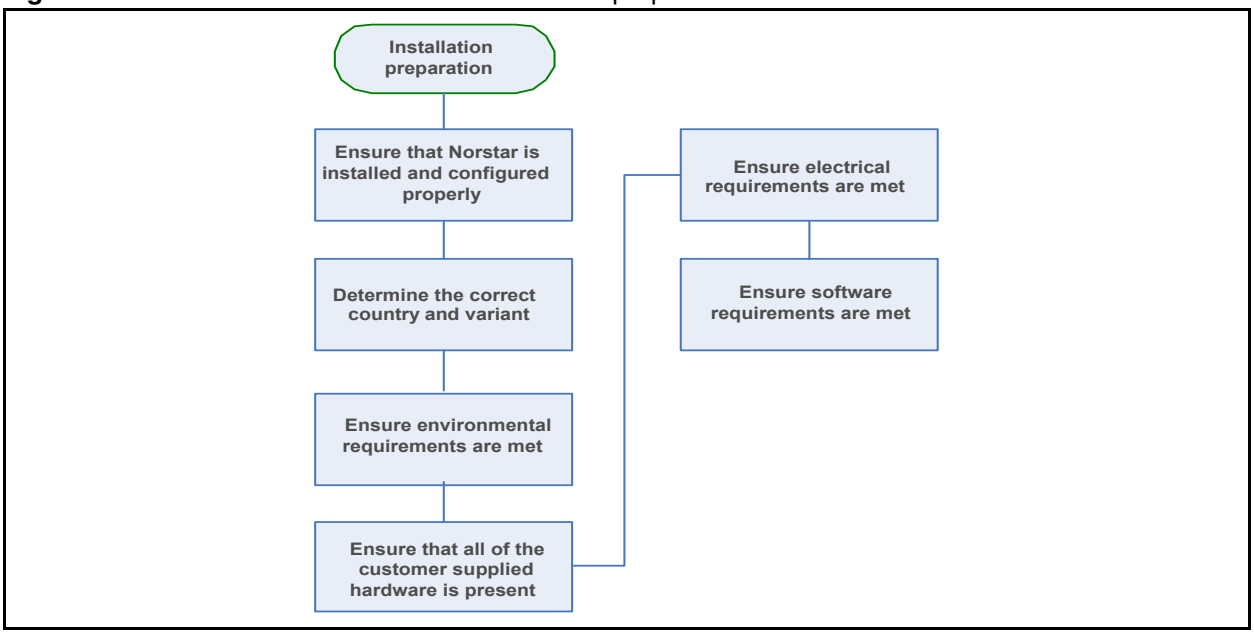
This chapter contains the following information:

- "Installation process map"
- "Host system setup requirements" on page 24
- "R2MFC card setup requirements" on page 24
- "Customer-supplied hardware requirements" on page 25

Installation process map

Figure 4 provides an overview of the R2MFC card installation preparation.

Figure 4 Overview of the R2MFC card installation preparation


Installation preparation
Ensure that Norstar is installed and configured properly
Determine the correct country and variant
Ensure environmental requirements are met
Ensure that all of the customer supplied hardware is present
Ensure electrical requirements are met
Ensure software requirements are met

Host system setup requirements

Table 1 describes the tasks that you must complete on the host system before proceeding with the installation of the R2MFC card.

Table 1 Host system setup requirements

Task	Location of task information
Install host system	Norstar: Modular ICS Installer Guide
Determine if host system has enough system capacity	Norstar: Modular ICS Installer Guide
Configure E1 Settings	Norstar: Programming Record

R2MFC card setup requirements

This section provides the following information about the setup requirements for the R2MFC card:

- "Config DIP switches"
- "Environment checklist"
- "Electrical requirements" on page 25
- "Software requirements" on page 25

Config DIP switches

Determine and set the Config DIP switches to the correct country code, and second dial tone setting for the R2MFC card. Predefined country codes are set by the Config DIP switches. Special configurations are set through the CLI. See "Configuring the R2MFC (external) link" on page 39 for a procedure on how to set the DIP switches for a predefined country code or how to create a special configuration to meet the installation needs.

The default country code setting is Mexico config 1. See Appendix A, "Config DIP switch settings and definitions," on page 77 for a list of the available country codes, the country default settings, and the second dial tone settings.

Second dial tone, when turned on, generates and supplies a second dial tone to the end user, after the end user dials the trunk access code. The end user hears a dial tone between the last digit of the access code, indicating that a line was accessed. See "Turning on second dial tone" on page 45 for a procedure on how to set the DIP switches, and configure the Norstar system for second dial tone to work properly.

Environment checklist

The R2MFC card environmental requirements are covered by the host system environment setup. See the Norstar Installer Guide supplied with the host system for details of environmental requirements.

Electrical requirements

The R2MFC card power is supplied through the chassis on the host sytem. See the Norstar Installer Guide supplied with the host system for details of the electrical requirements.

Software requirements

R2MFC card firmware upgrades are posted at *www.nortel.com* under **Support & Training > Technical Support > Software Downloads**. Access this web site to see if there is a newer version of firmware available than the firmware shipped on the R2MFC card. See "Upgrading firmware" on page 55 for information on how to upgrade to the latest release of firmware.

Customer-supplied hardware requirements

The following equipment is required to install of the R2MFC card:

- A Norstar digital telephone set for programming of the Norstar system.
- An E1 connection from local telephony service provider. A full description of the signaling provided over the E1 by the CO.
- Computer with monitor and serial port for access to the CLI. Required only if system is not using a country code defined by the Config DIP switches.

Chapter 3
Installing the R2MFC card

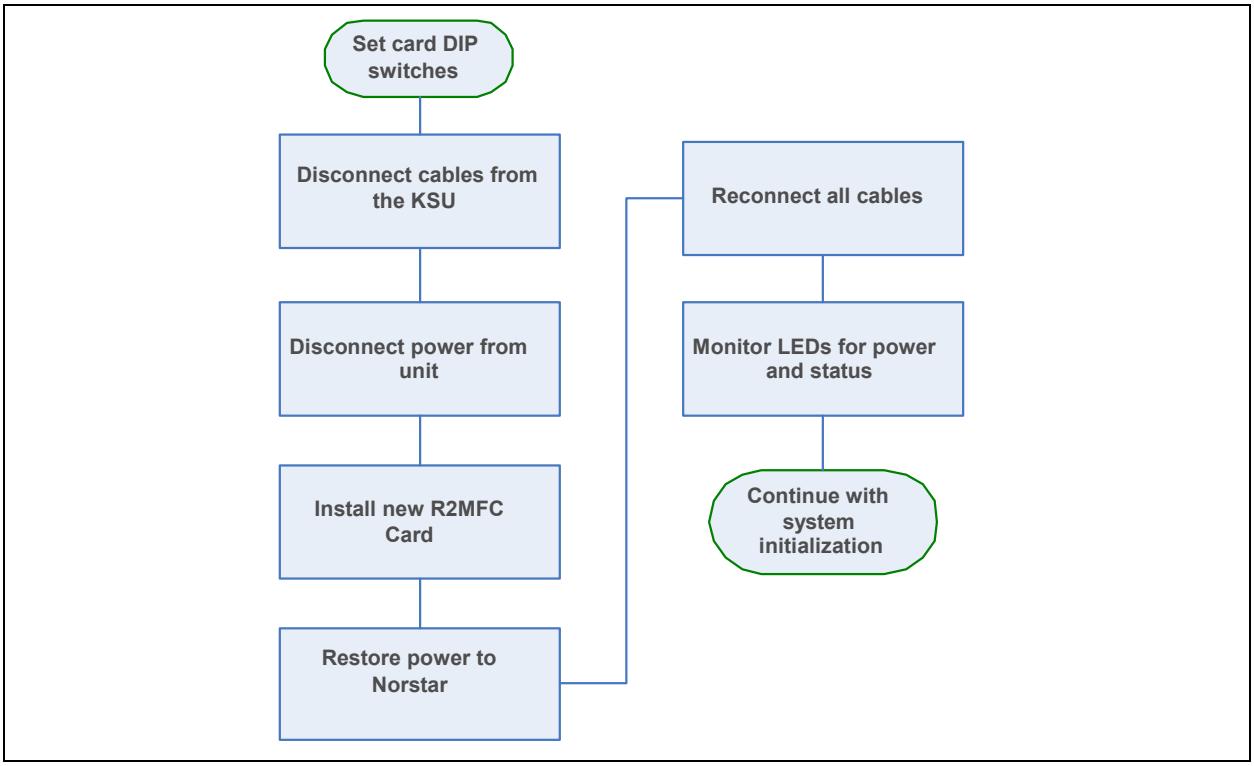
This chapters describes how to install and remove an R2MFC card in a host Norstar system.

This chapter provides the following installation and removal procedures:

- "Shutting down the system"
- "Installing an R2MFC card" on page 28
- "Removing an R2MFC card" on page 30
- "Wiring an R2MFC card" on page 31

Figure 5 provides an overview of the steps for installing the R2MFC card.

Figure 5 Overview of the R2MFC card installation


Set card DIP switches
Disconnect cables from the KSU
Disconnect power from unit
Install new R2MFC Card
Restore power to Norstar
Reconnect all cables
Monitor LEDs for power and status
Continue with system initialization

Shutting down the system

Before you shut down the system or perform any maintenance procedures, read the following warnings to ensure you and your system are properly protected.

Warning: If you are installing a new Norstar, refer to the Installer guide for the host system for instructions about installing a new system before you connect the system to the AC power outlet.

Warning: Failure to follow procedures to properly disconnect the Norstar and expansion unit can result in module or system damage.

Warning: Ensure you are properly grounded before handling modules or any components that are part of the Norstar hardware.

1 Attach one end of the grounding strap to your wrist and the other end to a grounded metal surface.

2 Ensure the cables connected to the front of the Norstar and the expansion module are clearly marked as to how they are connected.

3 Remove the cables from all the R2MFC cards on the Norstar base module and the expansion module (if attached).

4 Disconnect the Norstar and expansion module power cords from the AC outlet.

Installing an R2MFC card

Follow the procedures in this section to install an R2MFC card in a Norstar platform base module. Refer to the Installer Guide for the host Norstar system for detailed information on placement of cards.

Installing an R2MFC card in the Norstar system

Perform the following steps to install an R2MFC card in the Norstar system:

Caution: Only install the R2MFC card when the system is powered down. See "Shutting down the system" on page 27.

1 Ensure that the faceplate Config DIP switches on the R2MFC card are set correctly. For information on how to set the faceplate switches, refer to **"Setting Config DIP switches" on page 39**.

2 Select an open card slot.

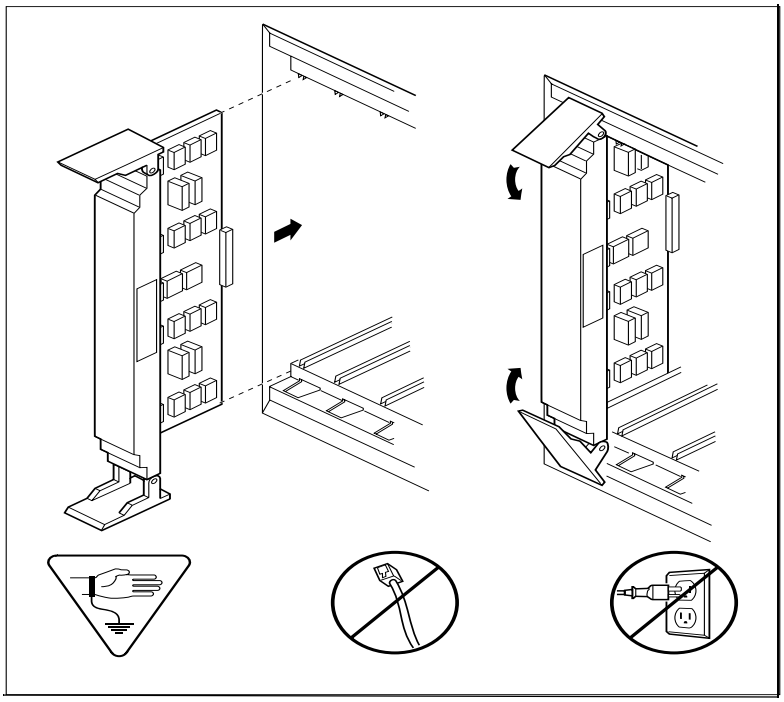
3 With the face of the R2MFC card facing toward you, insert the R2MFC card into the open slot.

Install trunk cartridges in the ICS (Integrated Communication System) beginning with Slot 4, then Slot 3.

4 Push the R2MFC card completely into the unit.

Figure 6 on page 29 shows an R2MFC card being installed.

Figure 6 Installing a R2MFC card



Warning: Close clips simultaneously.
It is important to center and close the two clips on the cartridge simultaneously, otherwise the cartridge may become misaligned in its slot or with its connector. If improperly inserted, the connector will be damaged.

Warning: PCB is electrostatic-sensitive.
Do not touch the printed circuit board on a cartridge. This is an electrostatic-sensitive device.

Reconnecting the equipment

After you install the card correctly into the bay, you must return the equipment to operation.

Caution: Complete the following steps carefully to ensure you return your system to operation without endangering the equipment or yourself.

1 Plug the power cords for the Norstar and any expansion modules back into the AC outlets.

Note: The Norstar system starts up when you connect the AC power cord. System startup takes several minutes to complete.

2 Connect the cables to the proper outlets on the R2MFC card on the Norstar.

3 Check that the LEDs on the newly installed R2MFC card are on and indicating the correct state. Refer to "Faceplate LEDs" on page 53 for a detailed description of the LED states.

4 Confirm that the Norstar is functioning properly by testing to make sure it works the same as it did before installing the R2MFC card.

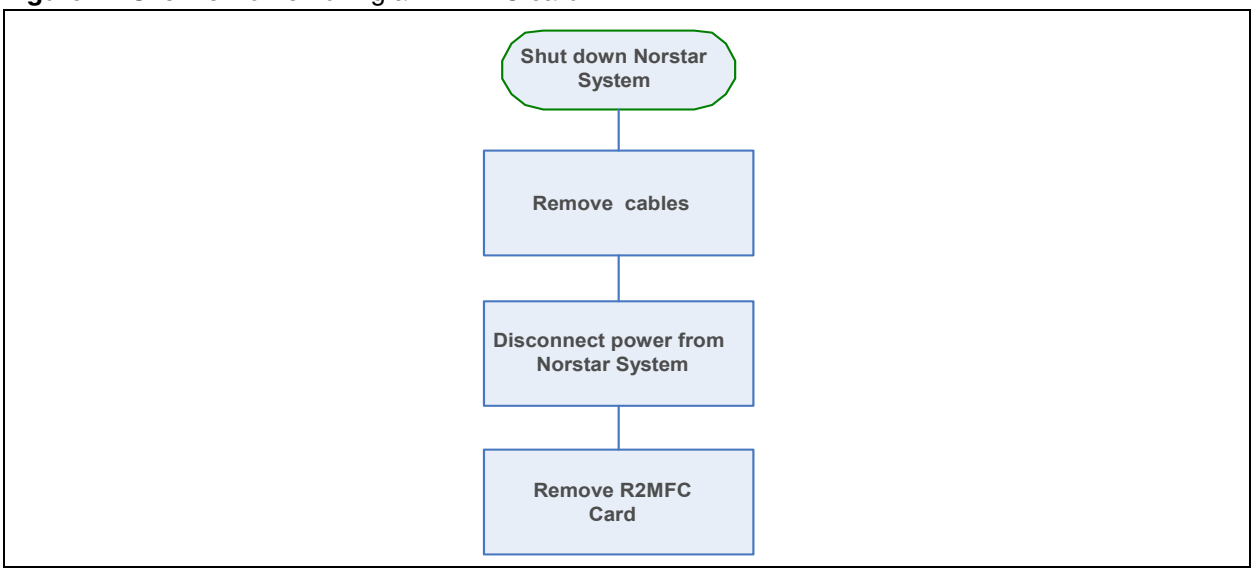
5 Configure the card. Refer to Chapter 4, "Configuring the R2MFC card," on page 35 for details.

Removing an R2MFC card

Follow the procedures in this section to remove an R2MFC card from a Norstar system.

Figure 7 provides an overview of the process for removing an R2MFC card.

Figure 7 Overview of removing an R2MFC card



Removing an R2MFC card from the Norstar System

Perform the following steps to remove an R2MFC card from the Norstar platform base chassis. Remove the R2MFC cards after the system is powered down.

1. Remove any cabling from the R2MFC card faceplate.
2. Power-down the Norstar system (see "Shutting down the system" on page 27).
3. Lift the clip located at the top of the R2MFC card and push down the clip located at the bottom of the R2MFC card. Pull outward to eject the R2MFC card from the Norstar system.
4. Grasp the top and bottom edges of the R2MFC card. Remove the R2MFC card from the Norstar system. Place the R2MFC card in a clean, safe, and static-free area.

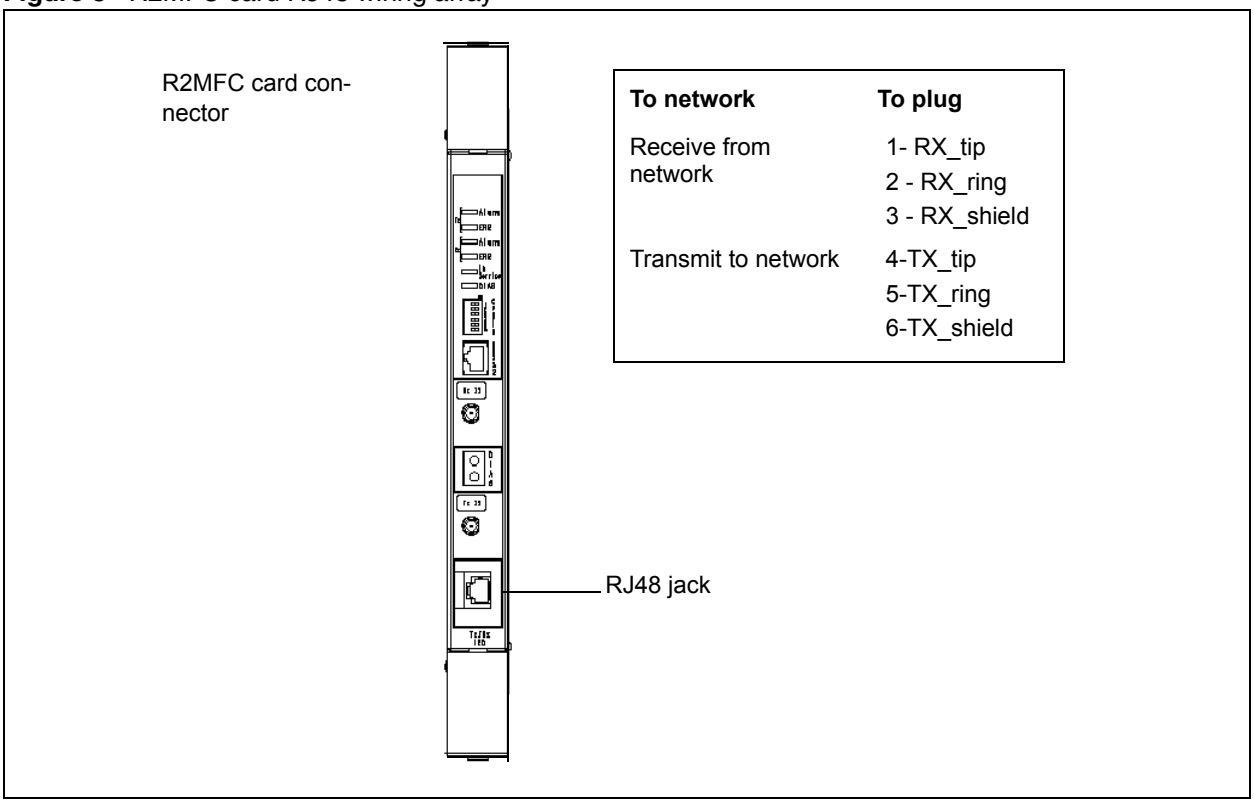
Wiring an R2MFC card

This section describes how to wire the cables that connect to the R2MFC card. The R2MFC card is connected to the CO by either RJ48C or BNC connectors. The BNC connector is the default interface. You can change the default connector either by setting the country - selection DIP switches or by creating a custom country code profile through the CLI. See **"Configuring the R2MFC (external) link" on page 39** for information on how to change the active interface. Refer to the Installer Guide for the Norstar host system for wiring not related to the R2MFC card.

If the 75 Ω BNC connector pair is used, you require two coax cables for transmit and receive.

If the 120 Ω RJ-48 connector is used, set up the cable pinout as shown in Figure 8 on page 32:

Figure 8 R2MFC card RJ48 wiring array



Warning: Allow only qualified persons to service the Norstar system.

Service personnel with the appropriate training and experience, must perform the installation and service of this unit. Service personnel must be aware of the hazards of working with telephony equipment and wiring. They must have experience in techniques that minimize any danger of shock or equipment damage.

Warning: Leakage currents
Service personnel must be alert to the possibility of high-leakage currents becoming available on metal system surfaces during power line fault events on network lines. These leakage currents normally safely flow to Protective Earth ground through the power cord. However, if the AC power is unplugged prior to disconnecting the cables from the front of the base function tray, high-leakage currents available on metal system surfaces can occur.

System shutdown: You must disconnect the R2MFC cardcables from the system before disconnecting the power cord from a grounded outlet.

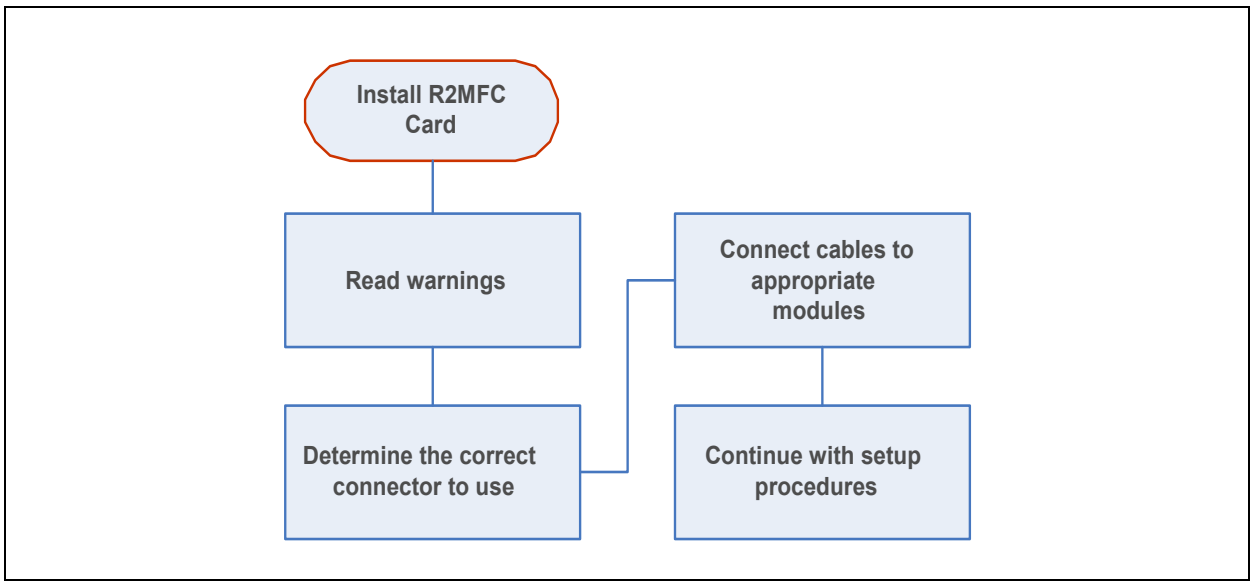
System startup: You must reconnect the power cords to a grounded outlet before reconnecting the cables to an R2MFC card.

Danger: Electrical shock hazards

Electrical shock hazards from the telecommunications network and AC mains are possible with this equipment. To minimize risk to service personnel and users, you must connect the Norstar system to an outlet with a third-wire ground. In addition, all unused slots must have blank faceplates installed. The covers on all units must be in place at the completion of any servicing.

Figure 9 on page 33 provides an overview of the process for connecting trunk wiring to the Norstar R2MFC cards.

Figure 9 Trunk wiring overview


Install R2MFC Card
Read warnings
Determine the correct connector to use
Connect cables to appropriate modules
Continue with setup procedures

Connecting an R2MFC card to a service provider

Warning: Electrical shock warning.

The Norstar R2MFC cards are safety-approved for installation into Norstar base units and expansion units. Both the installer and user are responsible to ensure that installation of the Norstar hardware does not compromise existing Safety approvals.

BEFORE YOU OPEN the Norstar base unit or Norstar expansion unit, ensure that the network telecom cables are unplugged, and that the unit is then disconnected from the AC power source.

Do not connect any telephones to wiring that runs outside the building.

Read and follow the installation instructions carefully.

Perform the following steps to connect an R2MFC card to the network:

1. Determine the connector type to be used, either RJ48C or BNC connectors.
2. Locate the appropriate connector on the front of the R2MFC card.
3. Attach the transmit BNC cable to the connector labeled Tx and the receive BNC cable to the connector labeled Rx, for countries using BNC connections. Insert the connector into the RJ48 jack on the card, for countries using the RJ48 connections. Figure 8 on page 32 shows the wiring pinouts for an R2MFC card to connect to a service provider using RJ48 connectors.
4. Use a Norstar telset to configure the lines or sets associated with the R2MFC card. Refer to the Norstar Installer guide for the host system for more information.

   Refer to the Norstar Installer guide for the host system for information on changing the default settings for each line/loop.

Chapter 4
Configuring the R2MFC card

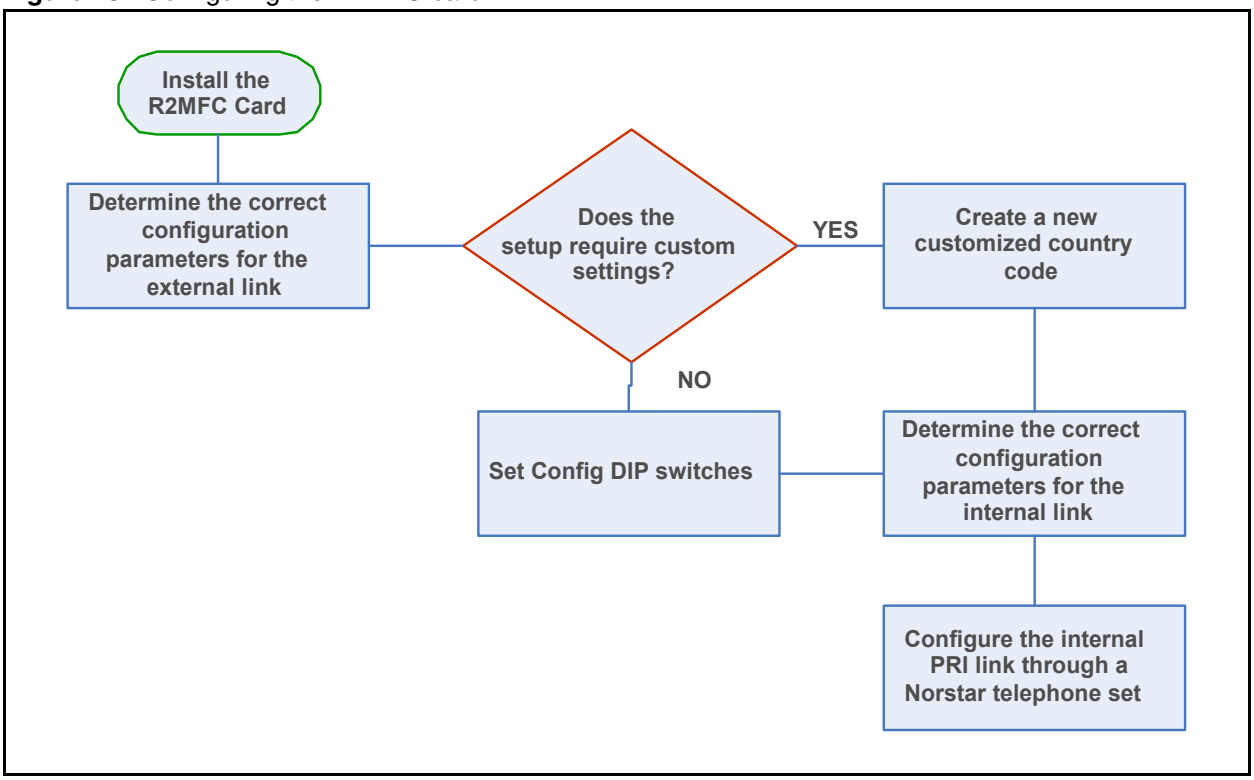
Trunk protocol conversion provides interworking between two different trunk protocols, and requires configuration for the following:

- E1- MFCR2
- E1- ETSI Euro-PRI

The R2MFC is the external interface. The external interface connects to a public network. The R2MFC card contains preprogrammed country-specific R2MFC settings that you can select using the DIP switches on the faceplate of the R2MFC card. The R2MFC settings can also be customized. The PRI is an internal link to the Norstar System. The PRI settings are configured to a predefined setting when the region is selected during Norstar System initialization. The PRI does not require customization, but it must be configured as detailed in "Configuring the PRI (internal) link" on page 43.

This chapter lists the configurable parameters of both the R2MFC side and the PRI side of the R2MFC card, and explains how to configure them. Figure 10 provides an overview of the configuration process.

Figure 10 Configuring the R2MFC card


Install the R2MFC Card
Determine the correct configuration parameters for the external link
Does the setup require custom settings?
YES
Create a new customized country code
NO
Set Config DIP switches
Determine the correct configuration parameters for the internal link
Configure the internal PRI link through a Norstar telephone set

R2MFC side (External Link) configurable parameters

Physical line characteristics

The R2MFC card has two options for physical connections on the faceplate:

1. RJ-48 connector for twisted pair cable (line impedance of 120 Ohms)
2. a pair of mini BNC connectors for coax cables (line impedance of 75 Ohms)

The BNC connectors can have one of the following:

- TX shielding connected to ground (default)
- RX and TX shielding not connected to ground

Only one of the two connector types can be active. The default active interface is the BNC connector. The BCN connector is part of the country-specific defaults for Mexico variant 1. Each of the country codes activates the appropriate connector, based on the country standard for connectors.

The active interface can be customized in the firmware through the CLI by using commands in the COnfig directory.

E1 framing

The external link uses Channel Associated Signaling on timeslot 16, therefore; TS16 multiframe format is always used. In addition, optional CRC4 multiframe can be used (for monitoring digital transmission quality), instead of basic “alternate frame” format.

The CRC4 multiframe option is activated by the firmware as part of the country-specific defaults.

PCM coding is A-law.

These settings can be customized in the firmware through the CLI by using commands in the ALarm directory.

Note: Configure changes made to the framing parameters in both the R2MFC card and the Norstar System.

Line signaling

Line signaling (for example, seize, answer, and disconnect) are implemented by R2 Channel Associated Signaling known as ABCD bits. Only the two bits AB are used for line signaling. The state (value) of the bits indicate the signal.

The channels are always bidirectional, (that is, they accept incoming calls or originate outgoing calls). The channel behavior also supports one-way trunks. The direction of the signal does not need to be configured. Because the R2MFC card is passive, the R2MFC card does not initiate calls; it only passes call origination attempts from one side to the other. The R2MFC card assumes that the two sides (Norstar System and CO) respect the direction of the trunk as agreed between them.

The meaning of the bit states are part of the country-specific parameters; however, they can be customized through the CLI by using commands in the R2 directory.

The following are additional options included in country-specific parameters:

- use backward force-release signal to clear back (yes/no)
- release-guard state (timer) when clearing back (timer value)
- optional CD bits value (usually ignored)

Register signaling

Register signaling (digits transmission) is implemented by in-band dual-tone signals known as MFC-R2. Physically, there are 15 forward signals and 15 backward signals. The standard defines two stages of the signaling. The meaning of the signal depends on the stage and the direction of the call. In total, there are four tables of 15 signals each. See Appendix A, “Config DIP switch settings and definitions,” on page 77 for MFC country-specific signal tables.

The meaning of MFC signals can be different when transmitted or received. MFC signal tables are part of the country-specific parameters. The meaning of the MFC signals in the R2MFC card are configurable through the CLI by using commands in the MFC directory.

The following are other options included in country-specific parameters:

End of dialing (incoming)

End of dialing for an incoming call can be configured by using the CLI. See Table 2, for the end of dialing options.

Table 2 Minimum (or fixed) number length + timer parameters (Sheet 1 of 2)

Option	Parameters	Meaning	Default
Explicit ‘End of dial’ signal (I-15)	None	The preset option for all countries. However, signal has low significance, because the end of dialing is determined by the Norstar System (PRI side) when it receives the last digit of the number.	Yes

Table 2 Minimum (or fixed) number length + timer parameters (Sheet 2 of 2)

Option	Parameters	Meaning	Default
Minimum (or fixed) number length and timer	Minimal number of digits	Receiving minimum number of digits + optional number of digits means end of dial (maximum length reached) When a fixed length number is always expected, set the optional number of digits to 0.	No
Minimum (or fixed) number length and timer	Optional number of additional digits		No
Minimum (or fixed) number length and timer	Interdigit timer in the minimal interval (long timer)	Expiry of the long timer means MFC error - number incomplete.	No
Minimum (or fixed) number length and timer	Interdigit timer in the optional interval (short timer)	Expiry of the short timer means end of dial.	No

End of dialing (outgoing)

End of dialing in outgoing calls is indicated by MFC signal “I15” (or equivalent country-specific signal). This signal is sent if the far-end requests next digit beyond the last digit of the dialed number.

When R2MFC card originates a call to the CO, the R2MFC card has already received the whole dialed number from the Norstar System. This is because the digits are passed from Norstar System to the R2MFC card by PRI “en-bloc.” This operation mode means that Norstar System determines user end-of-dialing either by number of digits, explicit input from user (for example, the “#” digit), or timeout.

Disable ANI

The ANI request option can be disabled. When disabled:

- Incoming call — R2MFC card does not request ANI.
- Outgoing call — When far end requests ANI, R2MFC card answers “ANI not available.”

Default category

The MFC subscriber category, sent by R2MFC card in outgoing calls, is fixed. The default category for all countries is II1 (subscriber without priority). If needed, the default can be changed by CLI.

Default subscriber status

The user can set default subscriber status (for example, free, busy, and vacant number) for incoming calls. When this feature is enabled, the R2MFC card in an incoming call sends the preset default subscriber status, instead of the status received from the PRI status.

The subscriber status option is not enabled in R2MFC card; therefore, the subscriber status is translated from ISDN message to MFC, and vice versa.

Configuring the R2MFC (external) link

The R2MFC (external) link is configured directly on the R2MFC card by setting DIP switches, and using a CLI on the R2MFC card. Standard predefined configurations already exist, and must be used, whenever possible. Country code configurations set by DIP switches, are hard-coded, and can be changed only by using the CLI. See "Setting Config DIP switches" for a description of how to set the predefined country code and second dial tone settings. The CLI can be used to create a customized country codes. See "Creating a customized country code" on page 40 for a procedure on how to create the customized country code.

Setting Config DIP switches

The Config DIP switch settings include diagnostic mode, country codes, and second dial tone. Country codes include the default settings for the connection (link) for the country selected. See Appendix A, "Config DIP switch settings and definitions," on page 77 for the country code DIP switch settings and their specifications.

Perform the following steps to set the Config DIP switches:

1 Set the Config DIP switches to the appropriate country code and second dial tone setting that coincides with your location.

Caution: Country configuration is read by the firmware upon power up or insertion into the ICS. Changing the country, while the R2MFC card is operating, causes the firmware to restart automatically after a delay of five seconds from the last DIP switch change. All active calls during the restart are dropped.

See Appendix A, "Config DIP switch settings and definitions," on page 77 for predefined country code DIP switch settings and their specifications.

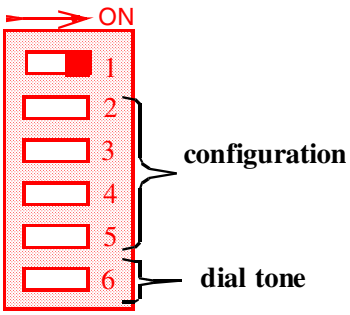
See "Turning on second dial tone" on page 45 for the procedure to turn on second dial tone.

The Config DIP switch settings are divided into the following parts:

- country or diagnostics - DIP switch 1
- country code - DIP switches 2 through 5
- second dial tone (on/off) - DIP switch 6

Figure 11 on page 40 shows the Config DIP switch layout.

Figure 11 Config DIP switch layout



Note: Mexico Config 1 country code is the factory default setting. It is the setting used if an invalid country value is set, or if a custom profile is selected that does not exist.

2 Insert the R2MFC card into the Norstar ICS.

Creating a customized country code

If the R2MFC card required settings are not identical to any country code, customization can be performed using the CLI through the serial port. Perform the following steps for configuring the customized country codes:

1 Set the Config DIP switches to match the country code closest to customer requirements. See Appendix A, “Config DIP switch settings and definitions,” on page 77.

Caution: Country configuration is read by the firmware upon power up or insertion into the ICS. Changing the country, while the R2MFC card is operating, causes the firmware to restart automatically after a delay of five seconds from the last DIP switch change. All active calls during the restart are dropped.

2 Make the required modifications by CLI. See Chapter 6, “Command Line Interface (CLI),” on page 59 for an explanation of how to access and navigate the CLI.

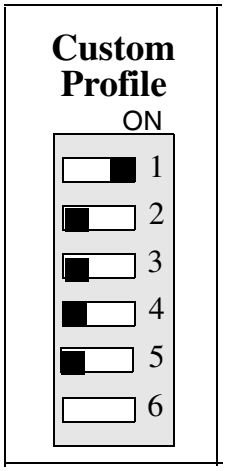
- Configuration changes made through the CLI immediately affect the operating parameters in RAM.
- Use the SaveCfg - (save configuration permanently on flash) command to save the new settings on non-volatile Flash memory.

The custom profile remains in EEPROM, even if different country codes are selected with the DIP switches, and is available again when the “custom profile” DIP switch setting is selected. The first configuration change by the CLI overwrites the existing custom profile as described above.

Note: Only one custom profile exists in EEPROM, so the SaveCfg command overwrites the previous custom profile saved to the EEPROM.

3 Set the Config DIP switches to custom profile. The new custom profile is used upon restart. See Figure 12 for the custom profile DIP switch setting.

Figure 12 Custom profile DIP switch setting



PRI side (Internal Link) configurable parameters

The R2MFC card is recognized by the Norstar System as a Euro-ISDN PRI line. The configuration for the PRI side (internal link) of the link is performed on the Norstar System through a Norstar digital telephone set. Refer to the Installer guide for the host system for complete information on the parameters that can be configured through the Norstar System. PRI side, internal link, and operational parameters for E1framing and signaling are listed below:

E1 Framing

The list of E1 framing parameters are listed in Table 3.

Table 3 E1 framing default parameters

Parameter	Operational Value
Frame format	alternate frame
PCM coding	A-law
Common Channel Signaling	TS16

Signaling

The list of layer 2 signaling parameters are listed in Table 4.

Table 4 Layer 2 signaling parameters

Parameter	Operational Value
D-channel	LAP D
Window size	7
Modulo	128

Layer 3 signaling parameters are listed in Table 5.

Table 5 Layer 3 signaling parameters

Parameter	Operational Value
Protocol	ETSI Euro-ISDN (ETS 300 102). The R2MFC card upper board is the NETWORK side, so the Norstar System must be configured as USER side.
Incoming calls from CO to Norstar System - Digit dialing mode	Overlap. Every digit is passed to the Norstar System; the Norstar System determines when the number is complete. The call can be set up immediately after the last digit is dialed.
Outgoing calls from Norstar System to CO - Digit dialing mode	Overlap - for systems requiring second dial tone from the R2MFC card.
Bearer capability for calls initiated by Norstar System	R2MFC accepts bearer capability requests of services: voice, audio, fax, modem.
Bearer capability for calls initiated from the R2MFC card to the Norstar System	Bearer capability indicates a normal voice service.

Configuring the PRI (internal) link

The Norstar System installs default settings for DTI cards that vary depending on the region chosen during startup. Your Norstar System must be in Profile 2 (this profile is for international systems that use ETSI ISDN lines with A-law). These settings for the R2MFC card can be verified and customized using a Norstar digital telephone set.

Perform the following steps to set your Norstar profile to Profile 2:

Note: You must perform this procedure BEFORE you run Startup, within the first 15 minutes after you plug in your KSU (Key Service Unit).

1. Retrieve the programming overlay from the Norstar Installer Guide provided with the host system.

   Telephone set overlays, showing the location of buttons, are found in the Installer Guide provided with the Norstar host system.

2. Place the programming overlay over the buttons on the Norstar phone set used to program the Norstar settings.

3. Enter the Profile access code from a programming set by pressing
   [Feature] [*] [*] [P] [R] [O] [F] [I] [L] [E] (**7763453).

4. Enter the password, when prompted:
   [C] [O] [N] [F] [I] [G] (266344).
   Region: PROF1 is displayed.

5. Press the key below `CHANGE` to scroll to profile number 2.

6. Click the display key for `OK` when you reach the profile 2.
   The display shows `Reset System`?.

7. Press `OK`.

8. Press [Drop] to exit.

Perform the following steps to verify and customize the PRI (internal) link:

1. Enter the Profile access code from a programming set by pressing
   [Feature] [*] [*] [C] [O] [N] [F] [I] [G] (**266344).

2. Enter the password, when prompted:
   [C] [O] [N] [F] [I] [G] (266344)

3. Select the hardware item, press [Next] until the display shows `Hardware`.

4. Press [Show].
   The display shows `Show module`.

5 Press Next.

The display shows `Card on KSU`.

6 Press Show.

The display shows `Cd1-KSU`.

7 Press Next until the display shows the card you want to view (CD1 — the right most DTI card).

8 Press CHANGE to view the different cards: `Loop, T1, PRI, BRI-U4, BRI-U2 or BRI-ST`.

9 Select PRI and press Show.

The display shows `Clear line data`.

10 Select `Y` (yes) to confirm your selection.

Note: You cannot change this setting unless you first disable the Trunk Cartridge using Module Status in Maintenance. Remember to enable the Trunk Cartridge once you complete the programing.

11 Press Next.

The display shows `Lines 001-030`.

12 Press Next.

The display shows `BchanSeq`.

You must choose the opposite setting of your service provider. However, if all lines for two DTI cards (configured as PRI) are in the same PRI pool, then you must set both cards to use the descending B-channel sequence mode. As a result, the service provider must use ascending mode.

13 Press CHANGE to select either `ascending` or `descending`.

14 Press Next.

The display shows `CRC4`.

15 Press CHANGE to select `OFF`.

16 Press Next.

The display shows `ClockSrc`.

17 Press CHANGE to toggle the setting (`Primary`).

18 Press Next.

The display shows `Ovlap recving`.

19 Press CHANGE to select `Y`.

20 Press Next.

The display shows `Lol num len`.

21 Press CHANGE and enter the appropriate number.

Press [phone] to exit.

Turning on second dial tone

Note: In most E1 network configurations, you need one DTI or DTI card configured as PRI in your ICS to act as a primary reference. The only application where you might not have a DTI or a DTI card configured as PRI designated as primary reference is in a network where your Norstar system is connected back-to-back with another switch using a E1 link. If the other switch is loop-timed to your Norstar system, your DTI or DTI card configured as PRI can be designated as a timing master.

If your Norstar system has two or more DTIs, you cannot assign more than one DTI as primary reference, or all of the DTIs as secondary reference. You can only have one primary reference and one secondary reference per system. See E1 or ISDN-PRI configuration for more information

Second dial tone is only available on Norstar MICS 6.0 or higher. Second dial tone, when turned on, generates and supplies, a second dial tone to the end user, after the end user dials the trunk access code. Second dial tone can be used with any country code, including customized country codes. DIP switch 6 is designated for turning on or off second dial tone. Changes to the dial tone DIP switch become effective as soon as the DIP switch changes position, and does not require a restart to take effect. The Norstar outgoing dialing must be set to Overlap in order for second dial tone to work properly.

Perform the following steps to turn on second dial tone:

1 Enter the Profile access code from a programming set by pressing

[Feature] [*] [*] [C] [O] [N] [F] [I] [G] (**266344).

2 Enter the password, when prompted:

[C] [O] [N] [F] [I] [G] (266344)

3 Select the `Services` item (press [Next] until the display shows `Services`).

4 Press [Show].

The display shows `Ringing Service`.

5 Press [Next] until the display shows `Routing Service`.

The display shows `Routing Service`.

6 Press [Show].

The display shows `Show Route:_ _ _`.

7 Type in the router number.

Rt3 nnn appears.

8 Press Show.

9 Press Next until the display shows `SrvcType`.

10 Press Show.

The display shows `Dial out:no number`.

11 Press Next until the display shows `Overlap`.

12 Press CHANGE to select Y.

13 Press to exit.

14 Set Config DIP switch number 6 to the ON position. See Figure 12 on page 41 for the Config DIP switch layout.

Chapter 5
R2MFC card maintenance

This chapter describes the general maintenance of the R2MFC card after it is installed and is running properly. It includes the following sections:

- Inter-working functionality
- "Clock synchronization" on page 48
- "Diagnostic tools" on page 49
- "Alarms" on page 50
- "Faceplate LEDs" on page 53
- "Logs and traces" on page 54
- "Error messages" on page 54
- "Replacing an R2MFC card" on page 54
- "Upgrading firmware" on page 55

Inter-working functionality

All channels on both sides of the R2MFC card are bidirectional: they accept both incoming and outgoing calls. If unidirectional trunks are used, the direction is handled by the far ends (Norstar and CO); the direction need not be configured in the R2MFC card.

In order to handle bidirectional calls, and eliminate internal collisions (when both sides originate a call on the same channel simultaneously), the R2MFC card allows flexible channel inter working; calls originating on a channel can use any free channel on the opposite side.

On incoming calls to the Norstar, the far-end (for example, CO switch) selects the MFC channel. The R2MFC card presents the call to the Norstar by PRI and allows the Norstar to determine which channel to use.

On outgoing calls, the Norstar selects on which PRI channel the call starts. The R2MFC card selects a free MFC channel, and originates the outgoing call on it. For this purpose, the R2MFC card supports 3 search methods to select a free MFC channel:

- Round robin (default)
- Linear ascending
- Linear descending

The MFC channel selection method can be modified through the CLI. See Chapter 6, "Command Line Interface (CLI)," on page 59 for commands available through the CLI.

During call setup, the following information is passed between the Norstar and the CO:

1 **Dialed digits** — Dialed digits are passed without any change. Up to 24 digits can be dialed. The MFC trunk is capable of repeating dialed digits on outgoing calls to the CO, when requested according to protocol.

   Digits are passed immediately to Norstar as they are received (PRI overlap mode) on incoming calls from CO to Norstar. This causes the Norstar to determine end of dialing, and to immediately signal call completion.

2 **Calling number** — (in PRI: CLID; in MFC: ANI) This number is passed without any change, and can be up to 16 digits long.

3 **Termination status** — Termination status is translated as presented in the Table 6. The table shows both directions. When translating a signal, only the bold value is used.

Table 6 Translation of Subscriber Status

Subscriber State	PRI Signal	MFC Signal[1]
Free (ringing)	ALERTING	**BW_FreeCharge** (B6) BW_FreeNoChrg (B7)
Busy	Cause 17	BW_Busy (B3)
Unallocated number	Cause 1	BW_Unlocated (B5)
Network congestion or general failure	Cause 42 All other values	**BW_B_Congest** (B4) Unknown signal
Line out of order	Cause 27	BW_OutOfOrder (B8)
Number changed	Cause 22	BW_ChangOrder (B2)

1 MFC signal is indicated by meaning. Actual signal depends on country; ITU/T standard is indicated in parentheses.

Other protocol-specific fields are not translated from side to side. They are handled as described Table 6 in the protocols implementation.

Clock synchronization

By default, the R2MFC card synchronizes on the external E1 line, and transmits this clock on the internal link to the Norstar. By doing so, the Norstar can synchronize on the external link.

Slips can occur between the Norstar and the R2MFC card, if the Norstar must synchronize on another DTI card. To avoid slips, the R2MFC card must synchronize on the internal link to the Norstar, instead of the external E1 line. Synchronization settings can be set up by using the CLI. See Chapter 6, “Command Line Interface (CLI),” on page 59 for commands available through the CLI.

Diagnostic tools

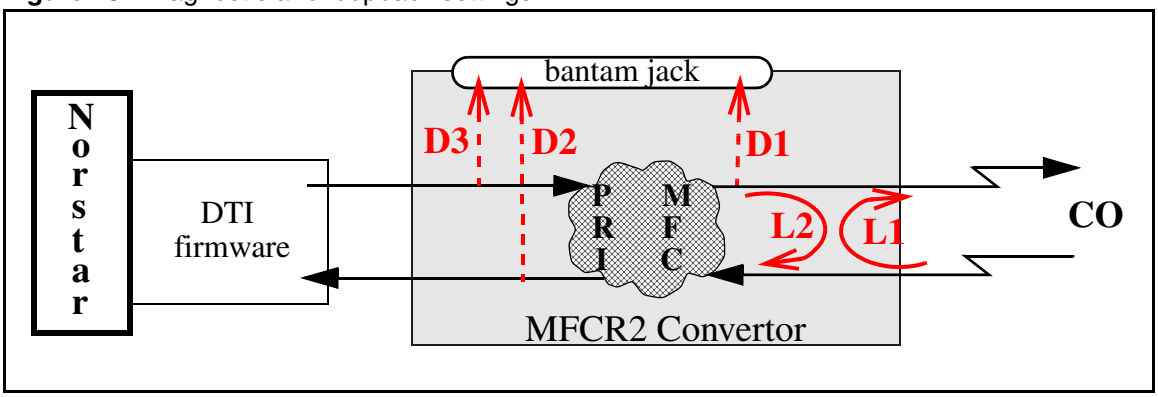
The R2MFC card has three diagnostic settings and two loopback settings available to help with the troubleshooting process. When the R2MFC card is running in diagnostic or loopback mode, the signals from the Norstar to the CO, or from the CO to the Norstar, can be intercepted by placing diagnostic equipment in the bantam jacks on the front of the R2MFC card. This allows the external R2MFC link, or the internal E1, to be checked for communication errors. The signal can be traced from start to finish, helping to determine the source of the errors.

See Table 7 for a description of the diagnostic and loopback modes. Figure 13 shows a diagram of the signal flows for both the diagnostic and loopback settings.

Table 7 Diagnostic and loopback modes

Mode	Description	Call Availability
Diagnostic Mode 1	Routes the E1 transmit signal from the Norstar through the R2MFC card out to the bantam jack.	Available to process calls
Diagnostic Mode 2	Routes the E1 transmit signal from the CO through the R2MFC card out to the bantam jack.	Available to process calls
Diagnostic Mode 3	Routes the E1 received signal from the Norstar out to the bantam jack without any interaction with the R2MFC card.	Available to process calls
Loopback mode 1 (continuity mode)	Routes the E1 signal received from the CO back out to the CO without any interaction with the R2MFC card.	Not available to process calls
Loopback mode 2 (card edge loopback)	Routes the E1 tranmitted signal from the Norstar through the R2MFC card and back to the Norstar.	Not available to process calls

Figure 13 Diagnostic and loopback settings



Setting the R2MFC card to diagnostic or loopback mode

The R2MFC card is placed in diagnostic or loopback mode by setting the Config DIP switches in either the diagnostic or loopback position. Perform the following steps to set the R2MFC card into either diagnostic or loopback mode:

1 Set the Config DIP switches to the desired diagnostic or loopback mode while the R2MFC card is still powered up. See See Appendix B, “Diagnostic and loopback DIP switch settings,” on page 107.

   The selected diagnostic or loopback mode becomes active five seconds after the last DIP switch change. The last country configuration stays in effect until a restart occurs.

2 Perform desired testing.

3 Reset the DIP switches back to the appropriate country code after testing has been completed so that the correct country code is read upon a restart.

Warning: Restarting the R2MFC card, while the Config DIP switches are in a diagnostic or loopback mode, causes the R2MFC card to start up in the diagnostic or loopback mode with the default country setting of Mexico config 1.

Alarms

Performance is monitored on both the internal (PRI) and external (MFC) links, but the actions when errors occur are different. Alarms and events handling include three types of actions:

1 Propagating Alarms:

   a Alerts the far-end by transmitting remote alarm indication (RAI).

   b Passes alarm conditions from link to link.

2 Reflecting alarm conditions on faceplate LEDs

3 Printing to error logs

Alarms Measurements

This section describes the mechanism and terminology of alarms measurements, and the actions taken when alarms occur or stop. Several performance indicators are monitored in order to detect E1 signal degradation; these indicators are categorized into two groups:

- **Group I** errors: These are events that can be counted, and are not continuous conditions. The number of events is counted, and is compared with thresholds (number of events in a specific time interval) used to evaluate the severity of the alarm condition.
- **Group II** errors: These are continuous conditions. These indicators can turn on and off rapidly, or they can remain on or off.

Each group of performance indicators are handled differently.

Group I errors

Each error has two thresholds of error rate, which defines two levels of error severity:

- Maintenance — error exists but acceptable (service available)
- Out Of Service (OOS) — severe error (service not available)

Group I errors are the following:

1 **Bipolar Violations (BPV)** — Errors in the bits coding.

2 **Frame Bit Error (FBER)** — Errors in the frame alignment word.

3 **SLIPs** — The replication or deletion of the 256 payload bits of an E1 frame. This error indicates that the local E1 clock is not synchronized with the far end.

4 **CRC-4 errors** — Received CRC code is not identical to a locally calculated code. This alarm is only relevant when in CRC-4.

5 **Far-end block error (FEBE)** — Far end has detected a CRC-4 error. This alarm is only relevant when in CRC-4.

Group II errors

Group II alarms occur when an alarm persists for a predefined period. The alarm is considered cleared when it does not occurred for a predefined period.

See Table 8 for incoming-signal Group II errors listed from highest to lowest priority. Group II errors are ordered by priority; when a high priority error exists, any errors of lower priority are irrelevant.

Table 8 Incoming signal errors (Sheet 1 of 2)

Alarm	Cause
Loss of Signal (LOS)	No reception of incoming electrical signal on the line (cable cut or removed).
Alarm Indication Signal (AIS)	Reception of incoming signal is all ones. Usually indicates that the far-end is out-of-service
Out-of-Frame (OOF)	No detection of Frame Alignment Signal. The incoming signal is corrupted. This alarm is also known as Loss of Frame (LFA).
Out Of Multiframe TS16 - (OOM_{TS16})	No detection of Multiframe Alignment Signal. When this alarm is active, Channel Associated Signaling (R2) is impossible. This alarm is not applicable to the PRI (internal link). This alarm is also known as Loss of Multiframe Alignment - (LMA).
Alarm Indication Signal in TS16 (AIS_{TS16})	Reception of AIS is all ones in TS16. This is an optional alarm. It can be enabled or disabled in configuration. By default, this option is **off**. When this alarm is active, any signaling on TS16 is impossible.

Table 8 Incoming signal errors (Sheet 2 of 2)

Alarm	Cause
Loss of CRC-4 Multiframe Alignment (OOM)	CRC-4 multiframe cannot be recognized. When this alarm is active, CRC-4 errors (of group I) cannot be measured. This alarm is relevant only when CRC-4 multiframe mode is used.
Remote Alarm Indication (RAI)	Indication that the far-end has trouble with its incoming signal. This alarm is also known as yellow alarm.
Remote Alarm Indication TS16 (RAI_{TS16})	Indication that the far-nd has lost TS16 multiframe alignment on its incoming signal. This alarm is not applicable to PRI (internal link).

Alarms propagation

This section describes the actions taken when alarms occur or stop. When alarms occur, the far-end is alerted by a remote alarm indication, and an alarm is transmitted on the opposite link. Table 9 table shows the reactions for Group I alarms when they enter the Out-Of-Service **(OOS)** state.

Table 9 Group I Alarms propagation

Error Condition	Alarm Transmitted to far end	Alarm sent on opposite link
BPV	RAI	AIS
FBER	RAI	AIS
Slips	RAI	AIS
CRC-4 errors	RAI	AIS
FEBE	none	none

Table 10 shows the reactions for Group II alarms when they persist.

Table 10 Group II alarms propagation

Error Condition	Alarm Transmitted to far-end	Alarm sent on opposite link
LOS	RAI	AIS
AIS	RAI	AIS
OOF	RAI	AIS
OOM_{TS16}	RAI_{TS16}	AIS
AIS_{TS16}	RAI_{TS16}	AIS
RAI	None	RAI
RAI_{TS16}	None	RAI_{TS16}
DCH down	None	AIS

Faceplate LEDs

There are two sets of LEDs on the faceplate of the R2MFC card. The system status LEDs are made up of the In Service LED and the Diag LED. Table 11 shows the LEDs and their states.

Table 11 System status monitor LEDs

	LED Status				
LED Name	**Green Solid**	**Green Flashing**	**Red Solid**	**Red Flashing**	**OFF**
In-Service	Normal Operation	Start Up	N/A	N/A	Out-of-Service
Diag	N/A	N/A	Test Mode	N/A	Normal Operation

- As the Norstar starts, the In Service LED is Green Flashing.
- When the R2MFC card operates properly, the In Service LED is Green Solid.
- During an alarm on the internal PRI link, the In Service LED is off.
- During test mode, the Diag LED is red.

The second set of LEDs on the faceplate indicate the operation status for the E1. Table 12 describes the LEDs and what status they indicate.

Table 12 System status monitor LEDs

LED Name	Yellow LED	OFF	Red LED
ALM Rx	Problem with digital input on external R2 link; link unusable.	Normal Operation	N/A
ERR Tx	Remote Alarm Indication (RIA) transmitted on external R2 link.	Normal Operation	N/A
ALM Tx	N/A	Normal Operation	Inability to transmit: Alarm Indication Signal (AIS) sent on external R2 link
ERR Rx	Degradation of digital input on external R2 link; link is still usable.	Normal Operation	N/A

- On power up, all four LEDs are set to off.
- The ERR Tx is only relevant when the ALM Tx and ALM Rx LEDs are off.
- ERR Rx is triggered when the Tx ALM exceeds maintenance thresholds: BPV, CRC4, and slip.
- ALM Tx is triggered by loss of communication with lower board (PRI board), or other internal error.
- ALM Rx is triggered by LOS, AIS, OOF, OOM, and when the ERR Rx alarm exceeds OOS threshold: BPV, CRC4, and slip.
- RAI transmission indicates a receive fault.

Logs and traces

Logs are available through the Logger directory in the CLI. This directory contains commands that allow filters to be placed on the E1, for different types of errors, down to the channel level. Errors can be stored in buffer, and then viewed or printed.

Error messages

Software error messages are available through the SWerr directory in the CLI. The errors are stored in a cyclic buffer that can be accessed to help in troubleshooting. See "SWerr directory" on page 69 for specific commands and details.

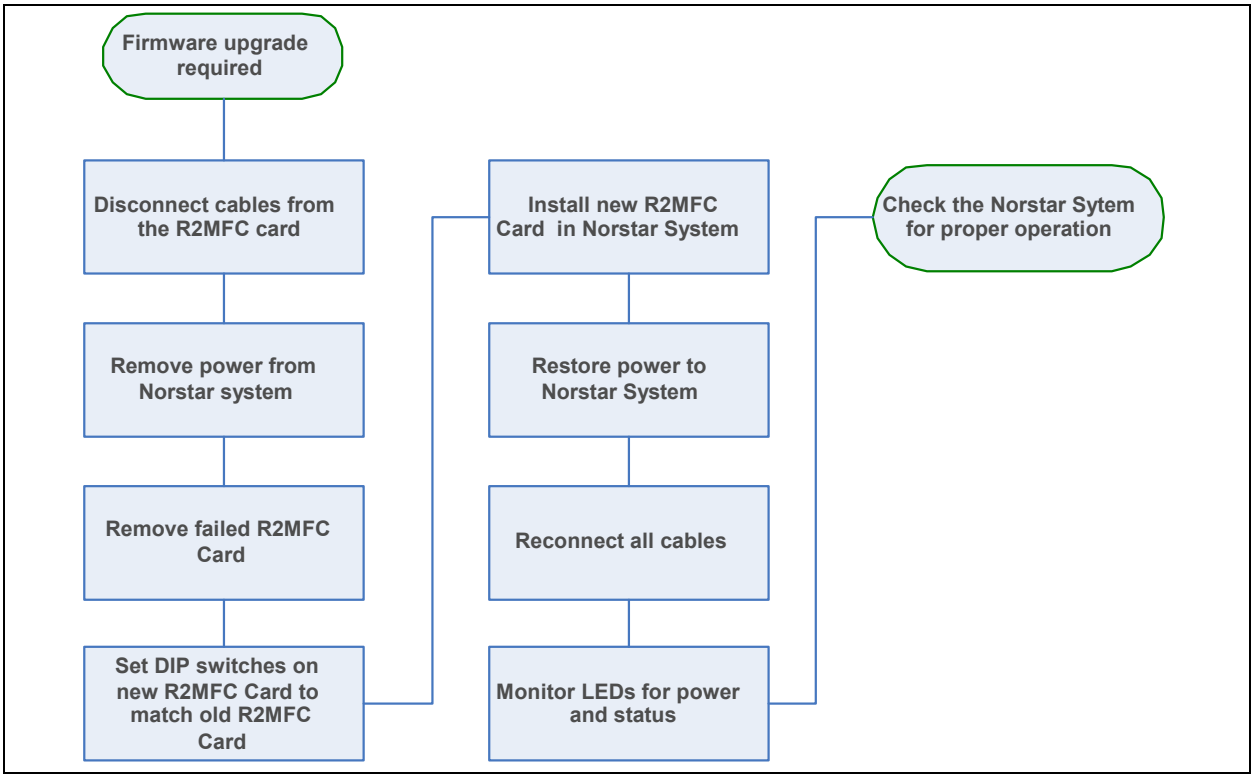
Replacing an R2MFC card

When an R2MFC card requires replacement, follow the steps in this section.

Warning: This section describes replacing a card with the same type of card. If you want to replace a card with a different type of card, you must treat it as a new installation. Refer to the Installation and Maintenance guide to ensure the new module does not overrun any lines already assigned to other card.

Figure 14 on page 54 provides an overview of the process for replacing R2MFC cards.

Figure 14 Overview of card replacement process


Firmware upgrade required
Disconnect cables from the R2MFC card
Remove power from Norstar system
Remove failed R2MFC Card
Set DIP switches on new R2MFC Card to match old R2MFC Card
Install new R2MFC Card in Norstar System
Restore power to Norstar System
Reconnect all cables
Monitor LEDs for power and status
Check the Norstar Sytem for proper operation

If replacement of the R2MFC card is required, perform the follow steps to properly replace the card:

1. Record any customized R2MFC card country code settings.
2. Remove all cables and disconnect the Norstar from the AC power outlet.
3. Follow the steps in "Shutting down the system" on page 27 to ensure the system shuts down correctly.
4. Use a flathead screw driver to release the top and bottom clips on the R2MFC card. Refer to Figure 6 on page 29 for the location of the clips.
5. Slide the R2MFC card out of the module in which it is installed.
6. Record the switch settings from the old R2MFC card.
7. Set the DIP switches on the new card to match the settings you recorded in the previous step.
8. Refer to "Installing an R2MFC card" on page 28 to install the R2MFC card in the module.
9. Refer to "Reconnecting the equipment" on page 30 to restore the system to operation.

Upgrading firmware

Normal installation does not require firmware download. A firmware upgrade can be required at some point to incorporate bug fixes or new features.

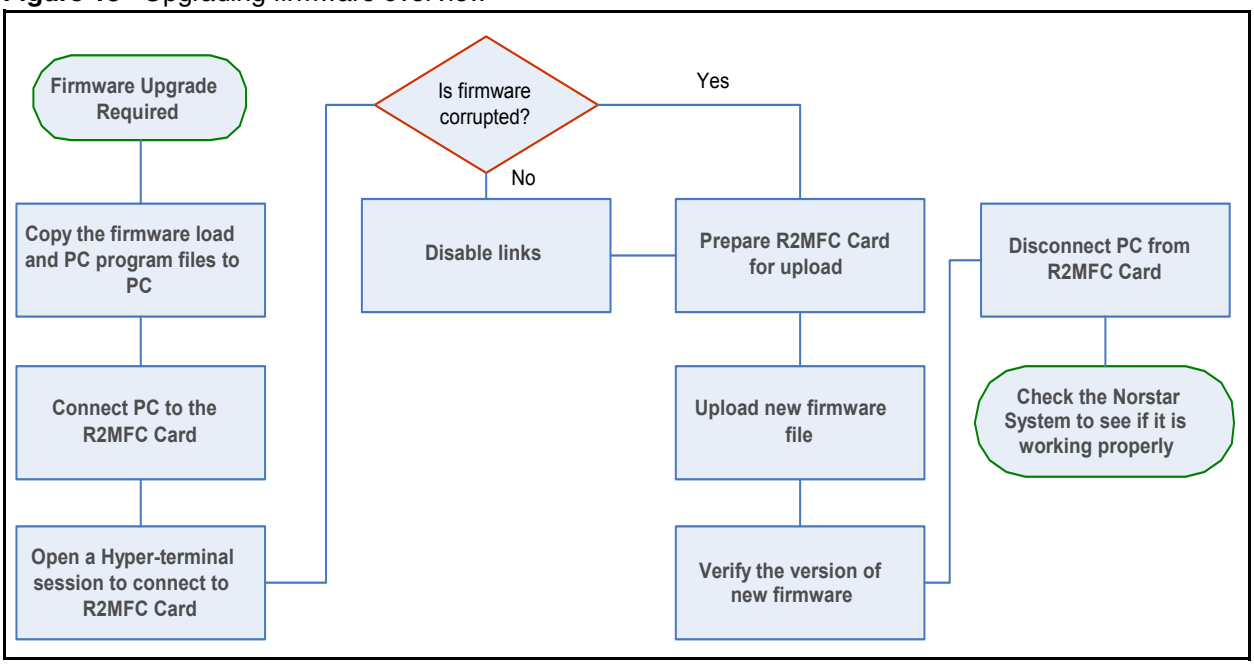
The following items are required for a firmware download:

- firmware load file
- PC connected to the RS232 serial port of the R2MFC card through COM1
- PC program delivered by the supplier: **Bload1.exe** for COM1

Note: The version of the firmware, running on an installed R2MFC card, is found by using the `Fwversion` command in the INfo directory of the CLI. See Chapter 6, "Command Line Interface (CLI)" for details on the CLI.

Figure 15 on page 56 provides an overview of the process for upgrading R2MFC card firmware.

Figure 15 Upgrading firmware overview


Firmware Upgrade Required
Is firmware corrupted?
Yes
No
Copy the firmware load and PC program files to PC
Disable links
Prepare R2MFC Card for upload
Disconnect PC from R2MFC Card
Connect PC to the R2MFC Card
Upload new firmware file
Check the Norstar System to see if it is working properly
Open a Hyper-terminal session to connect to R2MFC Card
Verify the version of new firmware

Perform the following steps to download the firmware the R2MFC card:

1 Copy the firmware load file and the PC program files, **bload1.exe**, to the same directory on the PC.

2 Use the shipped cable, part number N0026100, to connect a PC to the RS-232 port on the faceplate of the R2MFC card through COM1.

3 Open a new Hyper-terminal session on the PC using the parameters listed in Table 13.:

Table 13 Hyper-terminal setup parameters

Parameter	Setting
Connect using	COM 1
Bits per second	19 200
Data bits	8
Parity	None
Stop Bits	1
Flow Control	None

4 Go to step 11 if the existing firmware is corrupted. Corrupted firmware is indicated if the BOOT program displays:

```
load, switch, fload, fswitch, checksum, DisMem, DisWord, *=quit
----> user monitor:
```

5 Wait for the monitor line (flashing cursor) to appear on the terminal session.

6 Go to step 8 if the Norstar is not active and no calls are running. If calls are running, access the Control directory.

7 Execute the soft disable (LSD), or immediate disable (LID), to disable the links.

8 Enter the `load` subdirectory.

9 Execute `load y` command.

10 Wait for the output of the boot monitor.

11 Enter `fload` to prepare the R2MFC card for the uploading of firmware.

The R2MFC card will not respond while it is waiting for a download.

12 Release the COM port by closing the Hyper-terminal session.

13 Run the download programs on the PC through the **Start > run** menu:

• //*file path*/Bload1 <load_file>

The program responds: `starting rec 0. Hit any key to continue...`

14 Press <Enter>. The program starts the download, and shows its progress by displaying the number of processed records.

When finished, the program prints: `Download ended successfully!`

15 Verify the version of firmware uploaded by using the `Fwversion` command in the INfo directory of the CLI. See Chapter 6, "Command Line Interface (CLI)" for details on the CLI.

16 Close the program window.

17 Remove the cable (part number N0026100) connecting the RS232 port and the COM port from the R2MFC card.

Tips: Upgrading the firmware does not erase the custom profile, if the custom profile is saved in EEPROM.

Chapter 6
Command Line Interface (CLI)

Overview

This chapter describes the Command Line Interface (CLI) available through the serial port.

Command Line Interface (CLI) commands are organized as a tree of directories. Each directory contains a set of commands related to a specific purpose or subject. The available directories for R2MFC card are:

- LOad
- INfo
- VIew
- CNtrl
- COnfig
- ALarm
- SWerr
- MFC
- R2
- PRI

Note: Most directories and commands have a short form indicated by uppercase letters.

To access a directory, type the directory name or the short form. A list (or menu) of available commands or subdirectories displays. The commands are not case-sensitive.The list displays again if you type an incorrect command or an empty command.

To go to the previous menu level in the tree, type an asterisk (*).

Users and passwords

The CLI contains the following two hard-coded user names with passwords:

- **RS232** — This is the default user, which does not require a password. This user accesses configuration and maintenance commands.
- **admin** — Password: **admin**. This user has access to the same set of commands as RS232.

Note: Users and passwords are case-sensitive.

Accessing the CLI

The CLI is accessed through the RS-232 port on the faceplate of the R2MFC card. The cable that was shipped with the R2MFC card, part number N0026100, is used to connect a computer to the R2MFC card.

Perform the following steps to access the CLI:

1. Use the shipped cable to connect a PC to the RS-232 port on the faceplate of the R2MFC card through COM1.
2. Open a Hyper-terminal session on the PC using the following parameters:

Table 14 Hyper-terminal setup parameters

Parameter	Setting
Connect using	COM 1 or COM 2
Bits per second	19 200
Data bits	8
Parity	None
Stop Bits	1
Flow Control	None

3. Wait for monitor line (flashing cursor) to appear on the terminal session.
4. Switch to appropriate user by using the **`su`** command and entering the appropriate username and password.
5. Access the desired directory using the directory commands listed in this chapter.
6. Execute any desired commands.
7. Release the COM port by closing the Hyper-terminal session.
8. Remove the cable connecting the PC to the R2MFC card.

Commands

The following section lists and describes the CLI commands for the available directories.

LOad directory

Table 15 includes the CLI commands for firmware download and card restart. The commands are accessed from the LOad directory.

Table 15 LOad directory CLI commands

CLI command	Description
RST	Restarts card firmware regardless of current state. There is no prompt to confirm the restart.
load y	Configures the hardware to accept downloads
fload	Downloads the firmware.

INfo directory

Table 16 includes the CLI command to display and print information for troubleshooting problems in the field. The command is accessed from the INfo directory.

Table 16 INfo directory CLI commands

CLI command	Description
Fwversion	Displays the firmware versions and the state of the DIP switches.
SystTime	Prints the current time and how long the load has been in-service.
ALarm	Prints the status of the E1 alarms on both links.
ChannelSummary	Prints a summary of all PRI and MFC channels currently in use; for example, not in idle state

VIew directory

Table 17 includes the CLI commands to display the setup parameters. The commands are accessed from the VIew directory.

Table 17 VIew directory CLI commands

CLI command	Description
LNst	Displays the status of both links.
ChSt <chan1> <chan2>	Displays the status of the channels in the given range. Where: chan1 is the lower limit of the range. chan2 is the upper limit of the range. The values for chan1 and chan2 are 1...15, 17...31.
ChDt <chan>	Prints the channel data. Where: chan is the channel number in the range of 1...15, 17...31.
ChDtGrp	Prints data for a range of channels.
TT <num>	Prints the timer table that contains the timer values in milliseconds. Where: num is either 1 (Outgoing timers) or 2 (Incoming timers). If you do not enter a value for num, all timers are printed.
MR <mfc_link_no> <num>	Displays the MFC/R2 generic parameters for each link. Where: mfc_link_no is the value of the MFC link number, either 0 or 1. num is 0 (R2 signals), 1 (MFC Tx signals), or 2 (MFC Rx signals). If you do not enter a value for num, all MFC/R2 signals are printed.

CNtrl directory

Table 18 includes the CLI commands for maintenance functions. The commands are accessed from the CNtrl directory. All enable and disable commands are to be used for troubleshooting purposes only. For normal operation, both links and all channels must be enabled (default state). This includes links and channels in an environment with a partial E1 arrangement.

Warning: Channels are not available to process calls when a link is disabled. If a link is disabled the R2MFC card is out-of-service.

Table 18 CNtrl directory CLI commands (Sheet 1 of 3)

CLI command	Description
CSd <chan>	Performs channel soft-disabling. Where: chan is the channel number in the range of 1...15, 17...31. If there is a call on the channel, the system disables the channel after the current call process is complete. This command sends messages to both links.
CSdGrp <start_chan> <end_chan>	Performs soft-disabling on a group of channels. Where: start_chan is the first channel in the group. end_chan is the last channel in the group. The values for start_chan and end_chan are 1...15, 17...31. If there is a call on the channel, the system disables the channel after the current call process is complete. This command sends messages to both links.
CId <chan>	Performs immediate disabling on a channel. Where: chan is the channel number in the range of 1...15, 17...31. If there is a call on the channel, the system ends the call and disables the channel. This command sends messages to both links.
CIdGrp <start_chan> <end_chan>	Performs immediate disabling on a group of channels. Where: start_chan is the first channel in the group. end_chan is the last channel in the group. The values for start_chan and end_chan are 1...15, 17...31. If there is a call on a channel, the system ends the call and disables the channel. This command sends messages to both links.

Table 18 CNtrl directory CLI commands (Sheet 2 of 3)

CLI command	Description
CEnbl <chan>	Performs channel enabling. Where: chan is the channel number in the range of 1...15, 17...31. This command sends a message to both protocol handlers.
CEnblGrp <start_chan> <end_chan>	Performs channel enabling on a group of channels. Where: start_chan is the first channel in the group. end_chan is the last channel in the group. The values for start_chan and end_chan are 1...15, 17...31.
LSd	Performs link soft-disabling, which disables IDLE channels immediately. If there is a call in progress, the system disables the channel after the current call is complete. This command sends a message to both protocol handlers.
LId	Performs immediate link disabling. If there is a call in progress, the system ends the call and disables the channel. This command sends a message to both protocol handlers.
LEnbl	Performs link enabling. The command sends a message to both protocol handlers.
CoFlm <chan>	Transfers a disabled channel to an offline state. Where: chan is the channel number in the range of 1...15, 17...31. The command sends a message to both protocol handlers.
CoFlmGrp <start_chan> <end_chan>	Transfers disabled channels to an offline state. Where: start_chan is the first channel in the group. end_chan is the last channel in the group. The values for start_chan and end_chan are 1...15, 17...31. The command sends messages to both protocol handlers.

Table 18 CNtrl directory CLI commands (Sheet 3 of 3)

CLI command	Description
CoNlm <chan>	Transfers the channel to an online state. Where: chan is the channel number in the range of 1...15, 17...31. If the system accepts the message, the channel becomes disabled. This command sends a message to both protocol handlers.
CoNlmGrp <start_chan> <end_chan>	Transfers a group of channels to an online state. Where: start_chan is the first channel in the group. end_chan is the last channel in the group. The values for start_chan and end_chan are 1...15, 17...31. If the system accepts the messages, the channels become disabled.
MC <link_num>	Sets the side that is used as clock source. Where: link_num is either 0 (link 0) or 1 (link 1). If this command is entered without a parameter, the current clock master is printed.

COnfig directory

Table 19 includes the CLI commands for general card configuration. The commands are accessed from the COnfig directory.

Table 19 COnfig directory CLI commands (Sheet 1 of 2)

CLI command	Description
LinePhy <phy_mode>	Sets the physical interface type of the external E1 line. Where phy_mode can be: 0 indicating 120 Ohm (RJ48 connector). 1 indicating 75 Ohm (RX and TX, BNC connector), grounded shield. 2 indicating 75 Ohm (TX BNC connectors), not-grounded shield.
SaveCfg	Stores the current configuration on non-volatile Flash memory. All parameters are stored-country-specific and non-country-specific. The stored configuration is used when the config DIP switches on the faceplate are set to custom profile. Only one configuration (custom profile) is stored. This command deletes the previous configuration contents.

Table 19 COnfig directory CLI commands (Sheet 2 of 2)

CLI command	Description
EraseCfg	Erases the configuration from non-volatile Flash memory. As a result, the custom profile does not exist, and other parameters are not included in custom profile use factory default settings. A live system is not affected, because current configuration is stored in RAM. The R2MFC card tries to read configuration from Flash memory on restart.
DEbnc <link> <msec>	Updates the line signal debounce time. Where: link is the link number, either 0 or 1. msec is the time, in milliseconds, ranging from 10 to 200. The value for msec should be in multiples of 5. If not, then the system rounds it off to the nearest multiple of 5.
ST <year> <month> <day> <hour> <min> <sec>	Sets the current system time. Where: year = yyyy month = 1...12 day = 1...31 hour = 0...23 min = 0...59 sec = 0...59 If you enter the ST command without parameters, the system displays the current system time.

ALarm directory

Table 20 includes the CLI commands for alarm configuration and status. The commands are accessed from the ALarm directory.

Table 20 ALarm directory CLI commands (Sheet 1 of 2)

CLI command	Description
G1Res <link_no> <group I alarms>	Resets Group 1 alarm counters. Where: link_no is the link number, either 0 or 1. Group I alarms defines the group and can have values of: • 0 – BPV • 1 – FBER • 2 – SLIP • 3 – CRC4 • 4 – ALL
Bit3 <link_no> <bit3>	Used for bit 3 option handling. Where: link_no is the link number, 0 or 1. bit3 is the option flag, 0 (off) or 1 (on).
OP16 <link_no> <AIS_{TS16}>	Used for AIS_{TS16} option handling. Where: link_no is the link number, 0 or 1. AIS_{TS16} is the option flag, 0 (off) or 1 (on).
FR <link_no> <fr_mode>	Changes the frame mode. Where: link_no is the PCM link number, 0 or 1. fr_mode is 0 (ALTRNT2_FRM) or 1 (MULTIFRM_CRC4) Default for link 0 (external) depends on country selection. Default for link 1 (internal) is set to alternate and should not be changed to multframe.
G1th <link_no> <pra> <limcount>	Sets the group I alarm thresholds. Where: link_no is the PCM link number, 0 or 1. pra is the problem group I errors and can have values of: • 0 – BPV • 1 – FBER • 2 – SLIP • 3 – CRC4 limcount is the threshold error count in the range of 1...1000.

Table 20 ALarm directory CLI commands (Sheet 2 of 2)

CLI command	Description
GRDtime <link_no> <grs_state> <grd_time>	Changes group 1 alarm guard time for the required grade of service state. Where: link_no is the PCM link number, 0 or 1. grs_state is the grade of service state, 1 (mnt state) or 2 (oos state). grd_time is the guard time in the range of 20...50000.
G2Gtime <link_no> <grd_time>	Changes the group 2 alarm guard time for the required grade of service state. Where: link_no is the PCM link number, 0 or 1. grd_time is the group guard time in the range of 0...50000.
G2Ptime <link_no> <perstime>	Changes persistence time for group 2 alarm handling. Where: link_no is the PCM link number, 0 or 1. perstime is the persistence time for group 2 alarm handling in the range of 0...50000.
DB <link_no>	Displays the R2MFC card alarm task database content. Where: link_no is the PCM link number, 0 or 1.

SWerr directory

Table 21 includes the CLI commands for the Software Error (SWerr) utility. The firmware stores the Swerr messages into a cyclic buffer. The contents of the buffer are printed upon request.The commands are accessed from the SWerr directory.

Table 21 SWerr directory CLI commands

CLI command	Description
PS <num>	Prints the Swerr buffer constants. All the accumulated swerr messages are printed. Where: num is the number of error messages to print (optional). The buffer stores the 20 most recent messages.
GF	Displays the swerr error levels and control flags. There are three error levels: inform, serious, and fatal. Each level has two flags: Insert_flag, which stores error information in the buffer, and Print_flag, which prints to the serial port when an error occurs.
CF <level> <insert_flag> <Fast_print_flag> <user_func_addr>	Changes swerr control flags. Where: level is in the range of 0...2. insert_flag is true or false Fast_print_flag is in the range of 0...2 (0 = print, 1 = print, 2 = fast print). user_func_addr is the user function address (for firmware engineers only).
DEL < number>	Deletes swerr messages from the buffer. Where: number is the number of swerr messages to delete (oldest messages are deleted). Enter 0 to delete all swerr messages.
DWN	Prints detailed debug information for one swerr message, stepping down (back in time).
UP	Prints detailed debug information for one swerr message, stepping up (forward in time).
PP	Prints detailed debug information for the current swerr message.
HeLP	Prints the descriptions of all the commands in the swerr directory.

MFC directory

Table 22 includes the CLI commands for the configuration and control of MFC-R2 protocols. The commands are accessed from the MFC directory.

Table 22 MFC directory CLI commands (Sheet 1 of 3)

CLI command	Description
ICm <mfc_link> <incoming_timer_type> <msec>	Sets and displays incoming call timers. Where: mfc_link is the number of required mfc/r2 links. incoming_timer_type is one of the timers defined for incoming mfc call processing. msec is the time interval in msec.
OGm <mfc_link> <outgoing_timer_type> <msec>	Sets and displays outgoing call timers. Where: mfc_link is the number of required mfc/r2 links. outgoing_timer_type is one of the timers defined for outgoing mfc call processing. msec is the time interval in msec.
REgSign <mfc_link><rs_name>	Sets the register signaling Where: mfc_link is the number of the link, 0 or 1. rs_name is the signaling type, 0 (MFC) or 1 (SMFC).
AniOption <mfc_link><flag>	Enables or disables the ANI option. Where: mfc_link is the number of the link, 0 or 1. flag defines the ANI option as enabled (0) or disabled (1). When disabled, ANI is not requested in incoming calls and not transmitted in outgoing calls.
mfcINDia<flag>	Enables or disables the processing of the special MFC option for India. Where: flag defines the Special ANI digit option as enabled (0) or disabled (1). When enabled, the prefix of one is expected on incoming calls and is transmitted on outgoing calls.

Table 22 MFC directory CLI commands (Sheet 2 of 3)

CLI command	Description
CatgOpt <mfc_link> <flag>	Defines which MFC category to transmit in outgoing calls. Where: mfc_link is the number of the link, 0 or 1. flag defines the MFC category (default is 0).
DefltCatgVal <mfc_link><category>	Defines the MFC category value when CatgOpt is set to the default value. Where: mfc_link is the number of the link, 0 or 1. category is the MFC category in the range of 1...15.
SubsIndOpt <mfc_link> <flag>	Defines which subscriber status to send when an incoming MFC call terminates successfully. Where: mfc_link is the number of the link, 0 or 1. flag is the subscriber status, 0 (subscriber option is default value) or 1 (subscriber option is received value).
DefltSubsVal <mfc_link><subscriber>	Defines the subscriber status value when the SubsIndOpt commands is set to the default value. Where: mfc_link is the number of the link, 0 or 1. subscriber can have the values of: • 0 = speech_charge (A group) • 1 = free_charge • 2 = free_no_charge • 3 = control_charge
EndDialType <mfc_link><direction><type>	Defines how to handle MFC end of dial. Where: mfc_link is the number of the link, 0 or 1. direction is 0 (IC), 1 (OG), or 2 (both). type is either 0 (Ix signal) or 1 (fix number of digits).
SetDigitCount <mfc_link> <count_type> <value>	Sets the number of expected digits when the EndDialType is set to a fixed number of digits. Where: mfc_link is the number of the link, 0 or 1. count_type is either 0 (minimal range) or 1 (optional range). value has values of 3...12 for minimal range or 0...15 for optional range.

Table 22 MFC directory CLI commands (Sheet 3 of 3)

CLI command	Description
EndAniType <mfc_link><direction><type>	Defines how to determine end of ANI digits. Where: mfc_link is the number of the link, 0 or 1. direction is 0 (IC), 1 (OG), or 2 (both). type is either 0 (Ix signal) or 1 (fixed number of digits).
SetAniCount <mfc_link> <value>	Defines the number of expected ANI digits when EndAniType is set to a fixed number of digits. Where: mfc_link is the number of the link, 0 or 1. value is the expected number of ANI digits in the range of 1...16.
ARP <mfc_link> <Dig_num>	Sets the number of received DID digits, after which the R2MFC card sends ANI requests to the CO. Where: mfc_link is the number of the link, 0 or 1. Dig_num is the number of digit after which ANI is requested in the range of 1...20, or 0 (after the last digit). This command is for incoming calls only.
BCatOpt <mfc_link><pls/cmpl>	Defines BW_BCateg signal as pulse or compelled signal. Where: mfc_link is the number of the link, 0 or 1. pls/cmpl is either 0 (BCategory is compelled signal) or 1 (BCategory is pulsed signal).
MTS <mfc_link> <MFC_signal_meaning> <MFC_signal>	Sets the MFC transmit signals value. For each logical meaning, sets which MFC physical signal is actually sent. Where: mfc_link is the number of the link, 0 or 1. MFC_signal_meaning is one of the MFC signals meaning in the range of 0...49. See Chapter , “MFC Signal Definitions,” on page 109 MFC definition tables. MFC_signal is either Forward (I,II) or Backward (A,B) signals.
MRS <mfc_link> <MFC_signal> <MFC_signal_meaning>	Defines how to interpret received MFC signals. For each MFC physical signal sets its logical meaning. Where: mfc_link is the number of the link, 0 or 1. MFC_signal is either Forward (I,II) or Backward (A,B) signals. MFC_signal_meaning is one of the MFC signals meaning in the range of 0...49. See Chapter , “MFC Signal Definitions,” on page 109 for MFC definition tables.

R2 directory

Table 23 includes the CLI commands for R2 line signaling. The commands are accessed from the R2 directory.

Table 23 R2 directory CLI commands (Sheet 1 of 2)

CLI command	Description
RS <link> <line_signal_meaning> <R2_signal>	Sets the R2 signaling values. Where: link is the number of the link, 0 or 1. line_signal_meaning is one of the line signal meaning codes. R2_signal is the ABCD bits value of 0, 1, 2, or 3. Use this command after clearing the R2 signaling value. The R2 signaling values must follow these rules: FW_IDLE = BW_IDLE = FW_CLEAR_FORWARD FW_SEIZE != FW_IDLE FW_SEIZE != BW_BLOCK BW_SEIZE_ACK = BW_CLEAR_BACK = BW_BLOCK BW_SEIZE_ACK != BW_IDLE BW_SEIZE_ACK != FW_SEIZE BW_ANSWER: this signal must be different than all other BW signals. BW_FORCE_RELEASE: (if used) this signal must be different than all other BW signals.
CD <link> <CD_bits_value>	Sets a fixed value to be transmitted on CD bits. Where: link is the number of the link, 0 or 1. CD_bit_values is 0, 1, 2, or 3.
ER <mfc_link>	Erases the R2 signaling table values. Where: mfc_link is the number of the link, 0 or 1.
RingOpt <link><flag>	Sets the ringing signal. Where: link is the number of the link, 0 or 1. flag is either 0 (ringing signal is not used) or 1 (ringing signal is used).

Table 23 R2 directory CLI commands (Sheet 2 of 2)

CLI command	Description
SeizeOption <link><flag>	Sets seize interworking with opposite link upon detecting seize from far end. Where: link is the number of the link, 0 or 1. flag is either 0 (seize process is autonomic) or 1 (seize process is dependant). Autonomic - link responds to seize without waiting for opposite link ack. Dependant - link waits for opposite link ack before sending its ack.
SzAckOpt <link><flag>	Work with seize ack or not. Where: link is the number of the link, 0 or 1. flag is either 0 (seize ack is not used) or 1 (seize ack is used).
SearchMode <link><mode>	Sets MFC channel allocation mode. Where: link is the number of the link, 0 or 1 (applicable to link 0 only). mode is either 0(round robin), 1 (linear ascending), or 2 (linear descending) Round robin (default) - start search for next available channel after last channel used. linear ascending - search for next available channel from channel 1 up. linear descending - search for next available channel from 30 down. New defined mode is effective immediately after it is defined. It must be saved, by using the SaveCfg command, to remain in effect after a restart. The new mode is saved on the EEPROM, and is always in effect, regardless of the Config DIP switch settings (mode is not part of the country code configuration).

PRI directory

Table 24 includes the CLI commands for the PRI directory. The commands are accessed from the PRI directory.

Table 24 PRI directory CLI commands

CLI command	Description
UNS	Displays the user and network side information. For R2MFC card the value is hard-coded as network side.
SDT <dial_type>	Sets the dial type to overlap or non-overlap. Where: dial_type is either 0 (enblock/non-overlap) or 1 (overlap). The default is non-overlap.

Appendix A
Config DIP switch settings and definitions

This appendix shows the faceplate DIP switch settings for the country codes and for second dial tone. It also contains the definitions of the settings for the different countries codes.

See Figure 17 on page 78 for country code and second dial tone DIP switch settings.

Figure 16 shows the Config DIP switch layout.

Figure 16 Config DIP Switches

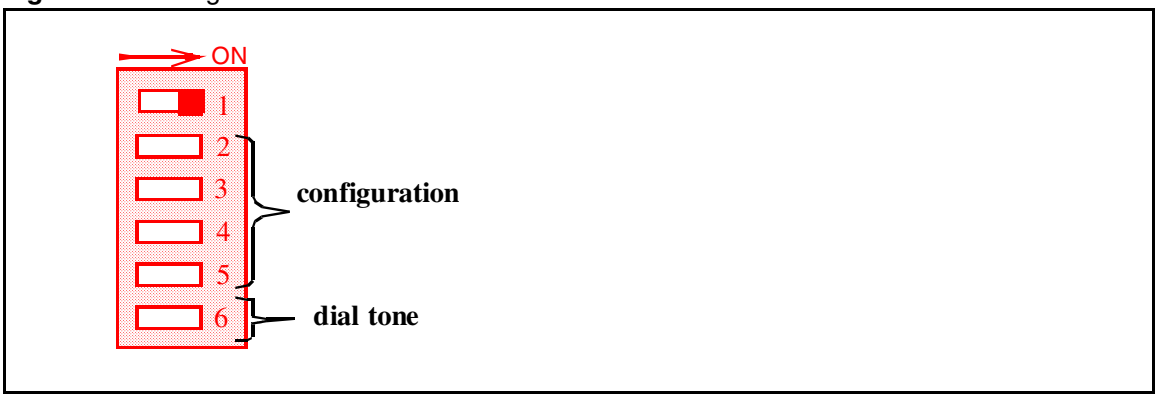
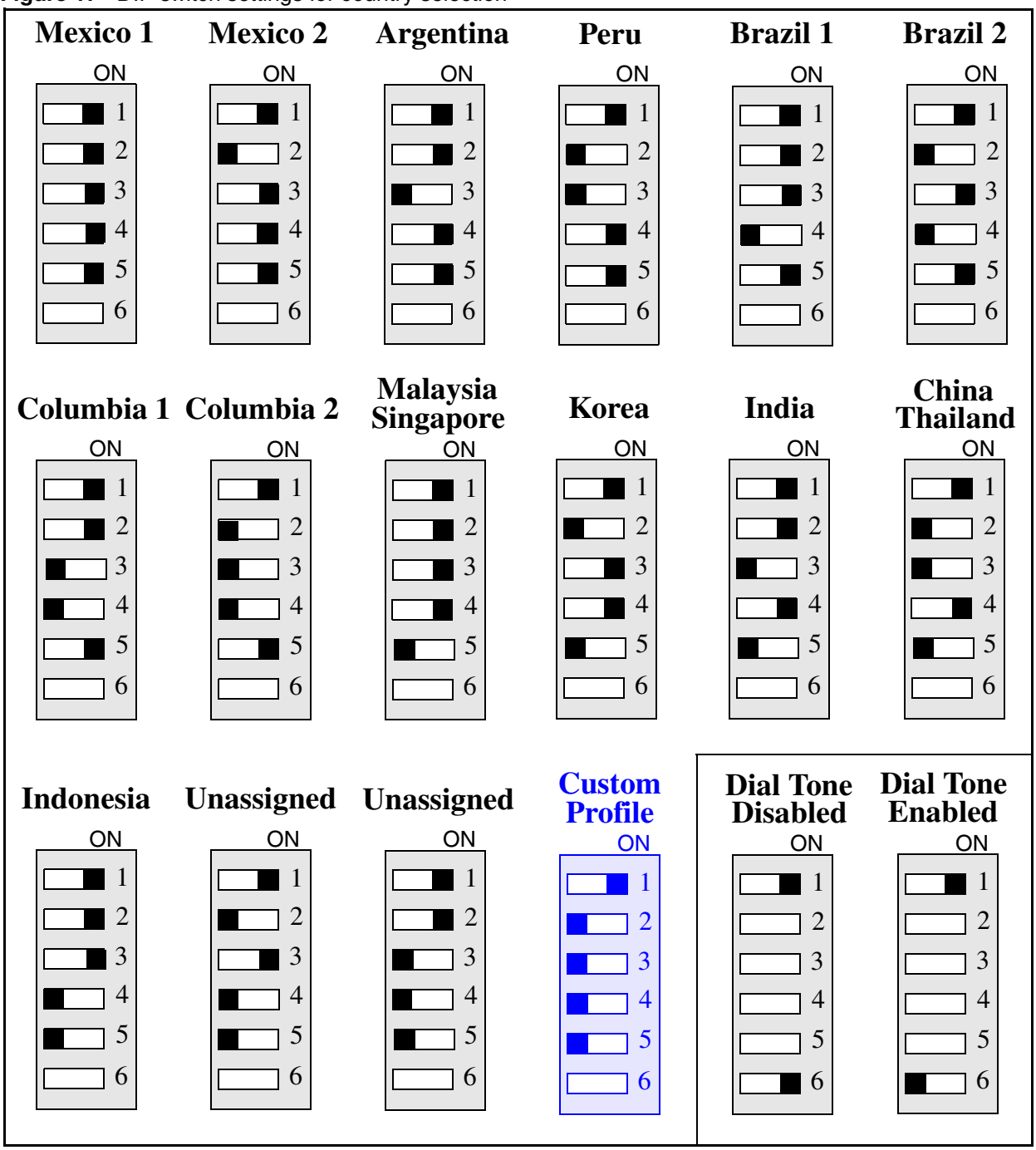


Figure 17 DIP switch settings for country selection



Note: Second dial tone is controlled using switch 6. Changes to this switch are effective immediately, and do not cause the R2MFC card to restart. Also, the Norstar must be set to outgoing dialing mode overlap for the dial tone to be heard.

Country code defaults

This section contains the default configuration associated to the country code set by the DIP switches on the faceplate of the R2MFC card.

Mexico Config 1

E1 physical characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 line signaling

Mexico Config 1 R2 signals are according to CCITT standard. See Table 25 for the Mexico Config 1 R2 signal definitions.

Table 25 Mexico Config 1 R2 A/B signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

Note: CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC register signaling

MFC signal definitions depends on the stage and the direction of the call; there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 26 shows the MFC signal configuration in the R2MFC card accessed through the CLI for Mexico Config 1. Table 27 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Mexico Config 1. These values are preconfigured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 26 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_DigitOrAni	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_ReSend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_B_Congest	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_RtrnToA	A_5	BW_FreeNoChrg	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_CatgSamDig	A_6	BW_B_Congest	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Illegal	A_7	BW_B_Congest	B_7
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Illegal	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_Illegal	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndANIdgts	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 27 Interpretation of transmitted MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A_1	FW_ReqFault	I 15	FW_Categ_1	II 1
BW_BCateg	A_3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A_5	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A_4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B_4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A_6	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO_SG	FW_Digit_4	I 4	FW_Categ_7	II 7

Table 27 Interpretation of transmitted MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_OrigDn	A_1	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B_1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B_5	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B_1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B_2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B_4	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B_4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B_4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Mexico Config 2

E1 physical characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 line signaling

Mexico Config 2 R2 signals are according to CCITT standard. See Table 28 for the Mexico Config 2 R2 signal definitions.

Table 28 Mexico Config 2 R2 A/B signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

Note: CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC register signaling

MFC signal definitions depends on the stage and the direction of the call; there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 29 shows the MFC signal configuration in the R2MFC card accessed through the CLI for Mexico Config 2. Table 30 on page 83 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Mexico Config 2. These values are preconfigured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 29 Interpretation of received MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDig	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_PrevDigit	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_B_Congest	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_Category	A_5	BW_Unlocated	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_SpeechChrg	A_6	BW_B_Congest	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Prev2Digit	A_7	BW_B_Congest	B_7

Table 29 Interpretation of received MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Prev3Digit	A_8	BW_OutOfOrder	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_OrigDn	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_ReSend	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_NextDig	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_Enddigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 30 Interpretation of transmitted MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 6	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 1	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 1	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B 1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 5	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 8	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Brazil Config 1

E1 physical characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 framing

Frame mode: Alternate

Register signaling

- Regret option: ON
- End of dialing (Incoming): 4
- End of dialing (Outgoing): 4

R2 line signaling

Brazil Config 1 R2 signals are according to CCITT standard. See Table 31 for the Brazil Config 1 R2 signal definitions.

Table 31 Brazil Config 1 R2 A/B signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

Note: CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call; there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 32 shows the MFC signal configuration in the R2MFC card accessed through the CLI for Brazil Config 1. Table 33 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Brazil Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 32 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDig	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_ReSend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_BW_OutOfOrder	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_CategOrAni	A_5	BW_FreeNoChrg	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_Illegal	A_6	BW_FreeCharge	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Prev2Digit	A_7	BW_Unlocated	B_7
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Prev3Digit	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_PrevDigit	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 33 Interpretation of transmitted MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 5	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 5	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 5	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B 1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 7	FW_Digit_10	I 10	FW_Categ_13	II 13

Table 33 Interpretation of transmitted MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Brazil Config 2

E1 physical characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 framing

Frame mode: Alternate

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 line signaling

Brazil Config 2 R2 signals are according to CCITT standard. See Table 34 for the Brazil Config 2 R2 signal definitions.

Table 34 Brazil Config 2 R2 A/B signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

Note: CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 35 shows the MFC signal configuration in the R2MFC card accessed through the CLI for Brazil Config 2. Table 36 on page 88 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Brazil Config 2. These values are preconfigured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, “Command Line Interface (CLI),” on page 59 for information on the CLI.

Table 35 Interpretation of received MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDig	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_ReSend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_B_Congest	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_CategOrAni	A_5	BW_FreeNoChrg	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_Illegal	A_6	BW_B_Congest	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Prev2Digit	A_7	BW_Unlocated	B_7

Table 35 Interpretation of received MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Prev3Digit	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_PrevDigit	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 36 Interpretation of transmitted MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 5	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 5	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 5	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B 1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 7	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Argentina Config 1

E1 Physical Characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 Framing

Frame mode: Alternate

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

Argentina Config 1 R2 signals are according to CCITT standard.See Table 37 for the Argentina Config 1 R2 signal definitions.

Table 37 Argentina Config 1 R2 A/B Signals

Forward			**Backward**		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 38 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDig	A_1	BW_B_Congest	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_PrevDigit	A_2	BW_FreeCharge	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_Busy	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_CategOrAni	A_5	BW_Unlocated	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_SpeechChrg	A_6	BW_FreeCharge	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Prev2Digit	A_7	BW_FreeNoChrg	B_7
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Prev3Digit	A_8	BW_OutOfOrder	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_SameDigit	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_ReSend	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 39 Interpretation of transmitted MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 5	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	A 6	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 5	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 6	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 7	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	NO SIG	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 3	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 5	FW_Digit_10	I 10	FW_Categ_13	II 13

Table 39 Interpretation of transmitted MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_OutOfOrder	B 8	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Columbia Config 1

E1 Physical Characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 Framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

Columbia Config 1 R2 signals are according to CCITT standard.See Table 37 for the Columbia Config 1 R2 signal definitions.

Table 40 Argentina Config 1 R2 A/B Signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 41 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_DigitOrAni	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_Resend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_ChngOrder	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_Illegal	A_5	BW_FreeNoChrg	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_A_Congest	A_6	BW_FreeCharge	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_A_Congest	A_7	BW_B_Congest	B_7

Table 41 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Illegal	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_Illegal	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 42 Interpretation of transmitted MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 15	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 6	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 1	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 5	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B 1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 3	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 3	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Malaysia and Singapore Config 1

E1 Physical Characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 Framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

Malaysia and Singapore Config 1 R2 signals are according to CCITT standard.See Table 37 for the Malaysia and Singapore Config 1 R2 signal definitions.

Table 43 Argentina Config 1 R2 A/B Signals

Forward			**Backward**		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 44 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDigit	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_Resend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_Unlocated	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_Illegal	A_5	BW_FreeNoChrg	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_CategOrAni	A_6	BW_B_Congest	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Illegal	A_7	BW_B_Congest	B_7
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_PrevDigit	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_Prev2Digit	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Category	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 45 Interpretation of transmitted MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 6	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7

Table 45 Interpretation of transmitted MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_OrigDn	A 6	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 5	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	NO SIG	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 3	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Korea Config 1

E1 Physical Characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 Framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

Korea Config 1 R2 signals are according to CCITT standard.See Table 37 for the Korea Config 1 R2 signal definitions.

Table 46 Argentina Config 1 R2 A/B Signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, “Command Line Interface (CLI),” on page 59 for information on the CLI.

Table 47 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDigit	A_1	BW_B_Congest	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_PrevDigit	A_2	BW_ChngOrder	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_Busy	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_CategOrAni	A_5	BW_Unlocated	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_SpeechChrg	A_6	BW_FreeChrg	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Prev2Digit	A_7	BW_FreeNoChrg	B_7

Table 47 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Prev3Digit	A_8	BW_OutOfOrder	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_ReSend	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 48 Interpretation of transmitted MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 5	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	A 6	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 5	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 6	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 7	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	NO SIG	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 3	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 5	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 8	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 2	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

India Config 1

E1 Physical Characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 Framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

India Config 1 R2 signals are according to CCITT standard.See Table 37 for the India Config 1 R2 signal definitions.

Table 49 Argentina Config 1 R2 A/B Signals

Forward			**Backward**		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 50 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDigit	A_1	BW_Illegal	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_ReSend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_Busy	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_OrigDn	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_CategOrAni	A_5	BW_Unlocated	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_Illegal	A_6	BW_FreeChrg	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Prev2Digit	A_7	BW_Unlocated	B_7
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_Prev3Digit	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_PrevDigit	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 51 Interpretation of transmitted MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 12	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	NO SIG	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 5	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7

Table 51 Interpretation of transmitted MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_OrigDn	A 4	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 6	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 10	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B 1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 3	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 5	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Note: A fixed number of ten ANI digits are transmitted. If less than ten digits are available, the outbound exchange fills the remaining place holders in the digit string with zeros (I-10).

An additional field is defined at the beginning of the ANI digits. The outbound exchange transmits a zero (I-10) if the ANI digits are not available, or a one (I-1) if the ANI digits are available in response to the first A-4 signal.

The India profile processes the prefix of one (1). To disable the processing of the one (1), use the monitor CLI command, mfcINDia, located in the MFC directory, and save the configuration as a custom profile.

China and Thailand Config 1

E1 Physical Characteristics

- Connector type: RJ-48 120 Ω
- Line coding: HDB3

E1 Framing

Frame mode: CRC4

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

China and Thailand Config 1 R2 signals are according to CCITT standard.See Table 37 for the China and Thailand Config 1 R2 signal definitions.

Table 52 Argentina Config 1 R2 A/B Signals

Forward			**Backward**		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are transmitted as a constant **11** and ignored on reception.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, "Command Line Interface (CLI)," on page 59 for information on the CLI.

Table 53 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDigit	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_ReSend	A_2	BW_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_Busy	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_Unlocated	A_5	BW_Unlocated	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_CategOrAni	A_6	BW_FreeCharge	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_A_Congest	A_7	BW_B_Congest	B_7
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_A_Congest	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_A_Congest	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Illegal	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

Table 54 Interpretation of transmitted MFC signals (Sheet 1 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 15	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 6	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	NO SIG	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 6	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 1	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	B 1	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 5	FW_Digit_10	I 10	FW_Categ_13	II 13

Table 54 Interpretation of transmitted MFC signals (Sheet 2 of 2)

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Indonesia Config 1

E1 Physical Characteristics

- Connector type: BNC 75 Ω
- Line coding: HDB3

E1 Framing

Frame mode: Alternate (card default, not affected by DIP switch)

Register signaling

- Regret option: OFF
- End of dialing (Incoming): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**
- End of dialing (Outgoing): terminated by indication from destination switch, or by MFC forward signal **FW_EndDigits**

R2 Line Signaling

Indonesia Config 1 R2 signals are according to CCITT standard.See Table 37 for the Indonesia Config 1 R2 signal definitions.

Table 55 Argentina Config 1 R2 A/B Signals

Forward			Backward		
Signal	A	B	Signal	A	B
Idle	1	0	Idle	1	0
Seize	0	0	Seize acknowledge	1	1
Clear forward	1	0	Answer	0	1
			Clear back	1	1
			Block	1	1

CD bits are not used. They are set to **01** in transmit direction, and are ignored in receive direction.

MFC Register Signaling

MFC signal definitions depends on the stage and the direction of the call, there are four tables of 15 signals each: the first stage uses **I** signals forward and **A** signals backward, and the second stage uses **II** signals forward and **B** signals backward. The meaning of the signals can also be different when being transmitted or received. Meanings of the MFC signals are configurable. MFC signal tables are part of the country-specific parameters.

Table 38 shows the MFC received signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. Table 39 shows the MFC transmitted signal configuration in the R2MFC card accessed through the CLI for Argentina Config 1. These values are pre-configured by the faceplate DIP switches as shown in Figure 17 on page 78. See Chapter 6, “Command Line Interface (CLI),” on page 59 for information on the CLI.

Table 56 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_1	I_1	FW_Categ_1	II_1	BW_NextDigit	A_1	BW_FreeCharge	B_1
FW_Digit_2	I_2	FW_Categ_2	II_2	BW_ReSend	A_2	BW_B_Busy	B_2
FW_Digit_3	I_3	FW_Categ_3	II_3	BW_BCateg	A_3	BW_Congest	B_3
FW_Digit_4	I_4	FW_Categ_4	II_4	BW_A_Congest	A_4	BW_B_Congest	B_4
FW_Digit_5	I_5	FW_Categ_5	II_5	BW_SpeechChrg	A_5	BW_FreeNoChrg	B_5
FW_Digit_6	I_6	FW_Categ_6	II_6	BW_CategOrAni	A_6	BW_B_Congest	B_6
FW_Digit_7	I_7	FW_Categ_7	II_7	BW_Illegal	A_7	BW_Unlocated	B_7

Table 56 Interpretation of received MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal	Meaning	Signal
FW_Digit_8	I_8	FW_Categ_8	II_8	BW_PrevDigit	A_8	BW_B_Congest	B_8
FW_Digit_9	I_9	FW_Categ_9	II_9	BW_Prev2Digit	A_9	BW_B_Congest	B_9
FW_Digit_0	I_10	FW_Categ_10	II_10	BW_Illegal	A_10	BW_B_Congest	B_10
FW_Digit_11	I_11	FW_Categ_11	II_11	BW_Illegal	A_11	BW_B_Congest	B_11
FW_ReqFault	I_12	FW_Categ_12	II_12	BW_Illegal	A_12	BW_B_Congest	B_12
FW_Digit_13	I_13	FW_Categ_13	II_13	BW_Category	A_13	BW_B_Congest	B_13
FW_Digit_14	I_14	FW_Categ_14	II_14	BW_Illegal	A_14	BW_B_Congest	B_14
FW_EndDigits	I_15	FW_Categ_15	II_15	BW_Illegal	A_15	BW_B_Congest	B_15

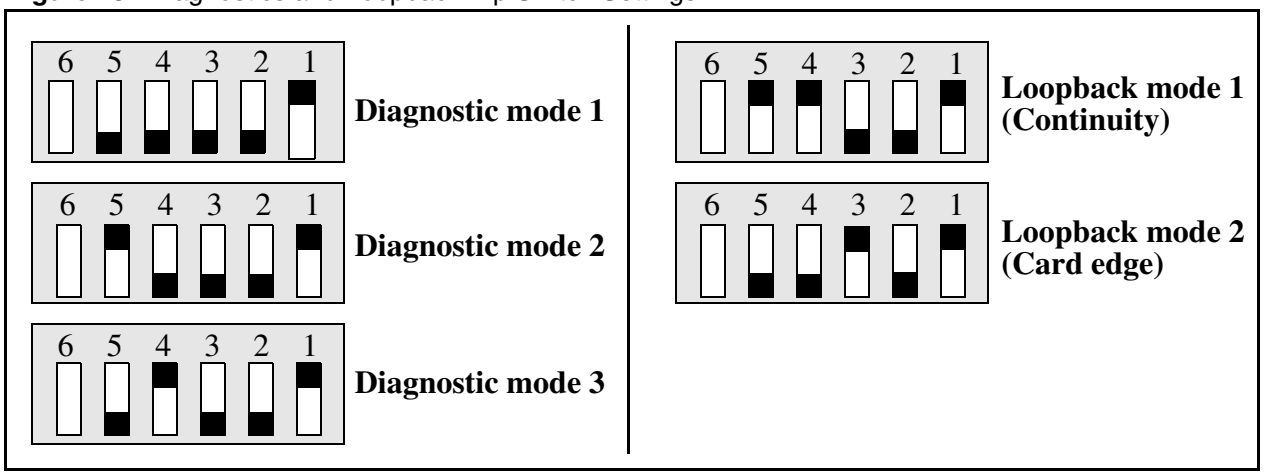
Table 57 Interpretation of transmitted MFC signals

Meaning	Signal	Meaning	Signal	Meaning	Signal
BW_NextDig	A 1	FW_ReqFault	I 15	FW_Categ_1	II 1
BW_BCateg	A 3	FW_EndDigits	I 15	FW_Categ_2	II 2
BW_RtrnToA	A 1	FW_EndANIdgts	I 15	FW_Categ_3	II 3
BW_A_Congest	A 4	FW_Digit_1	I 1	FW_Categ_4	II 4
BW_B_Congest	B 4	FW_Digit_2	I 2	FW_Categ_5	II 5
BW_Category	A 6	FW_Digit_3	I 3	FW_Categ_6	II 6
BW_SpeechChrg	A 5	FW_Digit_4	I 4	FW_Categ_7	II 7
BW_OrigDn	A 6	FW_Digit_5	I 5	FW_Categ_8	II 8
BW_FreeCharge	B 1	FW_Digit_6	I 6	FW_Categ_9	II 9
BW_FreeNoChrg	B 5	FW_Digit_7	I 7	FW_Categ_10	II 10
BW_CntrCharge	NO SIG	FW_Digit_8	I 8	FW_Categ_11	II 11
BW_Busy	B 2	FW_Digit_9	I 9	FW_Categ_12	II 12
BW_Unlocated	B 7	FW_Digit_10	I 10	FW_Categ_13	II 13
BW_OutOfOrder	B 4	FW_Digit_11	I 11	FW_Categ_14	II 14
BW_ChangOrder	B 4	FW_Digit_12	I 12	FW_Categ_15	II 15
		FW_Digit_13	I 13	FW_KD_Local	II 3
		FW_Digit_14	I 14	FW_KD_LnDst	II 2
		FW_Digit_15	I 15		

Appendix B
Diagnostic and loopback DIP switch settings

See Figure 18 for diagnostic and loopback DIP switch settings.

Figure 18 Diagnostics and Loopback Dip Switch Settings


6 5 4 3 2 1
Diagnostic mode 1
6 5 4 3 2 1
Diagnostic mode 2
6 5 4 3 2 1
Diagnostic mode 3
6 5 4 3 2 1
Loopback mode 1
(Continuity)
6 5 4 3 2 1
Loopback mode 2
(Card edge)

Appendix C
MFC Signal Definitions

See Table 58 for meaning of MFC signals.

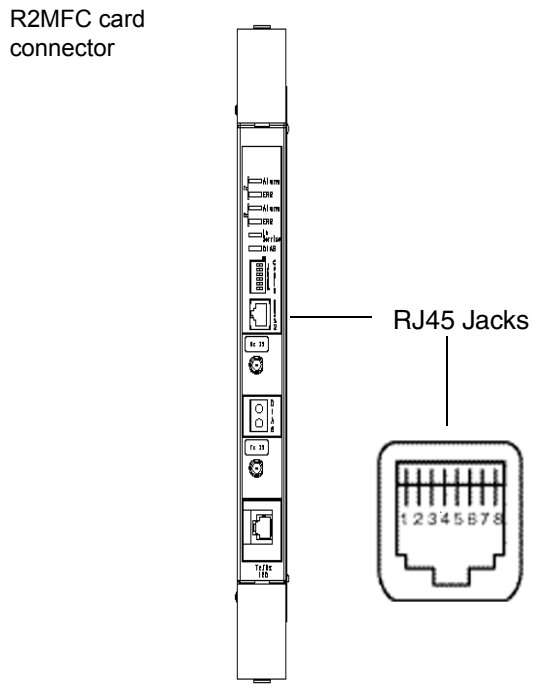
Table 58 MFC signal definitions

No	MFC sig meaning	N0	MFC sig meaning	No	MFC sig meaning
0	BW_NextDig	16	FW_EndDigits	33	FW_Categ_1
1	BW_BCateg	17	FW_EndANIdgts	34	FW_Categ_2
2	BW_RtrnToA	18	FW_Digit_1	35	FW_Categ_3
3	BW_A_Congest	19	FW_Digit_2	36	FW_Categ_4
4	BW_B_Congest	20	FW_Digit_3	37	FW_Categ_5
5	BW_Category	21	FW_Digit_4	38	FW_Categ_6
6	BW_SpeechChrg	22	FW_Digit_5	39	FW_Categ_7
7	BW_OrigDn	23	FW_Digit_6	40	FW_Categ_8
8	BW_FreeCharge	24	FW_Digit_7	41	FW_Categ_9
9	BW_FreeNoChrg	25	FW_Digit_8	42	FW_Categ_10
10	BW_CntrCharge	26	FW_Digit_9	43	FW_Categ_11
11	BW_Busy	27	FW_Digit_10	44	FW_Categ_12
12	BW_Unlocated	28	FW_Digit_11	45	FW_Categ_13
13	BW_OutOfOrder	29	FW_ Digit_12	46	FW_Categ_14
14	BW_ChangOrder	30	FW_ Digit_13	47	FW_Categ_15
15	FW_ReqFault	31	FW_Digit_14	48	FW_KD_Local
		32	FW_Digit_15	49	FW_KD_LnDst

Appendix D
CLI Cable Pinout

A special cable is required to connect to the RS232 port for use of the CLI. The cable, part number N0026100, is shipped with the R2MFC card. Figure 19 shows the cable pins for this cable if you are required to make a new cable.

Figure 19 Cable pinouts



Pin	Signaling
Pin 1	ignored
Pin 2	ignored
Pin 3	RXD (receive data)
Pin 4	ignored
Pin 5	GND (ground)
Pin 6	TXD (transmit data)
Pin 7	ignored
Pin 8	ignored